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The Influence of Electrical Stimulation of Muscles on the Development of Fatigue in Man — HARTMAN and BOUMAN

The Role of the Physical Therapist in the Total Care of the Child — RICHMOND

A Clinical Study of Testing and Treatment of Peripheral Vascular Diseases — GRIFFIN and JONES

A Simple Splint with Knee Cap As an Aid in Pre-Crutch Training — HOBERMAN and CICENIA

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The Influence of Electrical Stimulation of Muscles on the Development of Fatigue in Man

Anna C. Hartman, M.S., and Harry D. Bouman, M.D.

Introduction

During and since World War II it has become more and more apparent that a satisfactory conservative treatment for muscle spasm and contracture prevention is not available and is definitely desirable in order to help rehabilitate some 80,000 paraplegics. This need for a treatment that is yet unknown is recognized and some empirical experimenting and testing have been carried out.

Muscle spasm has as its origin a reflex shortening of skeletal muscle. Clinically, it is characterized by a prominence of tendons and flatness and narrowing of muscle bellies, with limitations of the range of passive joint motion, and is more pronounced the more abrupt and sudden the stretching movement is. It generally occurs in 40 percent of the entire group of muscles involved as a result of spinal cord injury. The increase in "tone" is usually in the antigravity muscles.

Spasticity has been attributed to loss of inhibitory impulses conveyed from the motor cortex to the spinal cord by the cerebrospinal tracts.

Section of Physical Medicine, University of Wisconsin Medical School, Madison, Wisc.

In patients who have sustained a complete transverse lesion above the lumbo-sacral cord, a number of reflexes return and the limbs become spastic. Flexor reflexes usually reappear earlier than extensor reflexes, so the first so-called "mass reflexes" are usually flexor.

It has been suggested that if a group of spastic muscles could be amply fatigued by electrical stimulation the involved extremity would become more prone to relaxation, so a passive exercise program, to combat contracture formation more satisfactorily, could be carried out. It is felt that some of these technics have met with a fair amount of success. Lee, et al., report on a group of twenty-seven cord-injury patients, sixteen with complete motor loss below the level of injury, who were given faradic current with the muscle held in tetanus for seven to fifteen minutes, resulting in relaxation of the muscle group immediately following use of the current. Relaxation persisted from two to six hours.

Sinusoidal current was used also and found to produce a longer period of relaxation following treatment; sometimes the effect lasted as long as twenty hours.

It is interesting to note that as yet no adequate physiological basis for this effect has been suggested. "Fatigue" of the spastic muscle group is credited, but, inasmuch as definite knowledge of "fatigue" is apparently limited, it appears necessary to prove the authenticity of such a statement.

According to Ash, " 'Fatigue' is a comprehensive term, which in its widest application embraces all those immediate and temporary changes, whether of a functional or organic character, which take place within an organism or any of its constituent parts, as a direct result of its own exertions, and which tend to interfere with or inhibit the organism's further activities. Its principal effect is loss of efficiency, a lessening of the capacity to do work or to sustain activity; its most obvious sign is depression—a lowering of sensitivity so that a given stimulus calls forth a response of less magnitude and intensity after exertion than before.

"If, then, fatigue represents a conflict between two opposing tendencies in the organism respecting the course which motor impulses shall take, one should expect the first symptoms of fatigue to be a loss of control in directing activities and in executing movements so as to make them coordinate with volitions. In other words, the ability to execute movements will remain after one has lost the power to control and coordinate them."

Thorndike says, "Fatigue of a muscle is a definite thing, i.e., the relative inability to overcome resistance."

Muscio says, "Fatigue may be defined as that condition in which a certain percentage of available organic energy has been transferred into heat or work."

Gilbreth calls fatigue "the after-effect of work. It is a necessary byproduct of activity. It is marked by a decrease in the power to do work."

Bartley and Chute say fatigue has three aspects:

1. Work decrement
2. Physiological effect
3. Feelings of weariness

All of these authors more or less agree to the fact that fatigue is a loss of the ability to do adequate work. By definition, work is the exertion of a force through a distance.

Clinically, the development of fatigue as a result of electrical stimulation has been much discussed, but few data are available to substantiate many of the opinions expressed. Most of the discussion has centered around possible damage which may result from electrical stimulation to the point of fatigue. While animal experiments seem to produce little evidence of damage as a result of fatigue, experiments on humans, with stimulation of the type which is normally used in the clinic, have not shown conclusive results. The recent suggestion that fatigue may be beneficial in certain conditions has reactivated interest in this matter.

We have, therefore, used electrical stimulation on normal human muscles with currents which are in common clinical use for this type of muscle. We have tried to evaluate the resulting fatigue by simple clinical methods. The aim of this investigation was not to measure minimal amounts of change in muscle power, but rather to see if a clinically significant fatigue could result from electrical stimulation in amounts which are in common clinical use.

With these references in mind, a series of tests were run on normal muscles, in an attempt to produce fatigue through electrical stimulation of a muscle, and to measure, comparatively, the amount of strength lost through onset of fatigue.

METHODS

A. *General technic*

Subjects used were a number of female adults with ages ranging from nineteen to forty years. All stimulation was done to "normal" human muscles.

1. A Stoelting dynamometer, calibrated in kilograms, was a preliminary measurement of the hand-grip strength of the subjects.

2. A coordination test was given by timing the subjects on the removal and replacement of a number of figures on a coordination pattern.

3. The stimulation was run at maximum contraction obtainable for a period of fifteen minutes, timed after the maximum strength of contraction had been obtained. The strength of contraction was limited by the pain tolerance of the subject. It is realized that perhaps, on a denervated subject, the question of pain of contraction might not be foremost as a criterion for stimulus strength. However, the unweighted hand of the subject was brought up to a position approaching ninety degrees flexion and held there, then relaxed.

4. The flexor group in the forearm and hand was stimulated by placing the active electrode on the muscle bellies.

5. After completion of the period of stimulation, the electrodes were immediately removed and the subject's grip and coordination again tested, as prior to the period of stimulation. The data was recorded.

6. Ten minutes after the stimulation, the strength of the grip and the timing of the coordination was again tested.

7. If, during the period of electrical stimula-

tion, the subject *felt* any apparent changes, she was asked to mention them to the tester.

8. By applying pressure measured at 50-60 mm. mercury to the upper arm, the venous blood flow was impeded to a degree and the forearm flexor group was stimulated for the purpose of noting any changes in work accomplished by circulatory interference.

9. Different weight-resistances to the flexor group were then applied while the venous circulation was partially obstructed, and the same test measurements were made, immediately after fifteen minutes of stimulation, before the pressure was released, and again ten minutes later, without the presence of pressure.

10. After using the dynamometer as a grip-tester through a series of tests, its constant readings would appear to render it consistent and accurate enough for this particular experiment.

11. The coordination pattern used was simple enough so that speed increases in accomplishment could be attributed to the practice effect, if the presence of fatigue were not felt.

B. *Description and evaluation of stimulating machine*

The Teca Model CD 7, a comparatively new electrical stimulating machine now on the market, was used in making all tests. Because of the untested potentialities of this machine, it was deemed advisable to compare it, first, with a similar machine which had been carefully tested. (General Electric X-ray Corporation variable-frequency generator.) Therefore, the stimulating qualities of the sine currents of the General Electric machine (which was perfected at Northwestern University and used for some time at the Wisconsin General Hospital) and the Teca Model CD 7 were compared in the following manner:

1. Comparison on ten normal subjects between surging 2,000-cycle current of the CD 7 machine with modulated 60-cycle current produced by the General Electric machine

2. Comparison of the same current at 20 cycles per second produced by both machines in ten subjects

3. Comparison of skin tolerance of a 20-cycle-per-minute, surging, uninterrupted current with alternate polarity (Unmodulated current at 20/min. or slow sinusoidal unmodulated at 20 per min.)

Experiment I

The General Electric stimulating machine was set at a frequency of 60 cycles per second, while the Teca Model CD 7 was set at its maximum frequency of 2,000 cycles per second.

The subjects were requested to take an amount of current up to comfortable tolerance only, to submit to stimulation for a period of from five to ten minutes at this point, and to comment freely, without prejudice, on their feelings and their preference between the two machines, at the end of the treatment. Some of the subjects were familiar with electrical stimulation, its feeling and application, and others had never administered nor received electrical stimulation before. The hamstring group, composed of the biceps femoris, semitendinosus, and semimembranosus, was used for experimentation. The larger, inactive, dispersive electrode was placed beneath the prone patient on the upper part of the quadriceps, and the active electrode was placed on the posterior surface of the thigh in a position to stimulate the hamstring group.

In all instances the Teca machine was used first, followed directly by the General Electric machine. The machines were well warmed-up; the current control was set at zero. The patient was prepared for the onset, and the current was turned up slowly so he could become accustomed to it. When his maximum comfortable-tolerance peak was reached, the variables milliamperage and voltage were recorded, and the stimulation continued at that intensity for from five to ten minutes. Then the current was gradually diminished until it was again at zero.

Ten subjects were stimulated in the above manner and the following data were compiled for each individual:

TABLE 1

Hamstring Group
Percentage of Stimulation per Minute—5
Current Used—Surging Sine

	G. E. MACHINE *Frequency of Cycles per Second—60*		TECA MACHINE *Frequency of Cycles per Second—2,000*		
	INT. M.A.	Contraction	INT. M.A.	Volts	Contraction
1	18	none	37	6	good
2	18	none	41	6	good
3	18	good	55	5	good
4	12	none	56	6	good
5	16	slgt.	52	6	good
6	10	none	55	6	good
7	14	fair	56	8	strng
8	16	good	26	7	good
9	15	none	51	6	good
10	18	fair	52	6	strng

The intensity range accepted from the General Electric machine was 10 to 18 milliamperes. At these peak intensities the subjects complained of disagreeable skin sensations. Some were getting electrical contractions of the hamstring group, others were not.

The intensity range accepted from the stimulation by the Teca model ranged from 26 to 41 milliamperes at 5 to 8 volts. Subjects were apparently quite at ease under this stimulation.

Experiment II

A second series of tests were run, similar to the first in all respects, except that the frequency was changed to 20 cycles per second in both machines. In these tests, the intensity tolerated by the Teca CD 7 model was considerably lowered, while the current tolerated from the General Electric machine was the same in some cases, and lowered slightly in others. However, the CD 7 still elicited all "good" contractions as judged by the operator, while in some cases the contraction obtained by the General Electric machine varied from "slight" to "good."

The intensity range accepted from the General Electric machine was 11 to 19 milliamperes, the individual, subjective, comfortable tolerance being taken in each instance. The intensity range accepted from the Teca CD 7 was from 12 to 27 milliamperes, with subjects stating that, at this frequency, when the tolerance was reached there wasn't too much difference noted between the two skin sensations. Both were now unpleasant.

TABLE 2

Hamstring Group
Percentage of Stimulation per Minute—5
Current Used—Surging Sine
Frequency of Cycles per Second—20

	G. E. MACHINE		TECA MACHINE		
	INT. M.A.	Contraction	INT. M.A.	Volts	Contraction
1	14	slgt.	20	12	good
2	11	slgt.	12	19	good
3	18	fair	19	20	good
4	19	good	26	18	good
5	16	good	27	25	good
6	13	fair	20	21	good
7	14	good	22	15	good
8	12	slgt.	14	20	good
9	17	fair	18	19	good
10	16	good	24	20	good

Experiment III

A third series of tests was tried to compare the skin sensations produced by the two machines on surging, uninterrupted direct current at alternate polarity (unmodulated carrier or slow sinusoidal at 20 cycles per minute). The General Electric machine was used without modulation, and the CD 7 control was on full wave without pulsations.

In four instances the Teca CD 7 direct current could be tolerated at a higher milliamperage than the General Electric stimulator, by from 1 to 7 milliamperes. In five cases the toleration for the General Electric stimulator was greater than the Teca by from 1 to 8 milliamperes. In one case the milliemperage tolerated from the two machines was equal. This data would indicate that there is very little noticeable difference in the milliamperage which can be tolerated on direct current at 20 cycles per minute without modulation or pulsations from the two machines.

TABLE 3

Forearm Muscle Group
Percentage of Stimulation—5
Frequency of Cycles per Second—20/min.

	G. E. MACHINE *Current Used D.C.*		TECA MACHINE *Current Used D.C. full wave*		
	INT. M.A.	Sensation	INT. M.A.	Volts	Sensation
1	12	burning pain	8	16	burning pain
2	20	"	25	22	"
3	24	"	24	17	"
4	25	"	32	20	"
5	4	"	5	15	"
6	8	"	12	22	"
7	18	"	10	19	"
8	10	"	8	11	"
9	18	"	17	19	"
10	16	"	15	17	"

The physical ripple voltage was determined on the two machines, using load resistances of 700 ohms and 2,000 ohms for each. The ripple read for the Teca CD 7 was from 0.1 to 0.15 percent; the ripple read for the General Electric stimulator was from 0.2 to 0.25 percent. The General Electric machine has been in use at the clinic approximately eighteen months, while the Teca has been used approximately four months.

1. The Teca machine at its maximum frequency of 2,000 cycles per second was compared with the General Electric machine at its often-used frequency of 60 cycles per second.

2. An increased current intensity was tolerated from the Teca machine, with contractions from "good" to "strong" elicited.

TABLE 4—TEST I

Subject	Before Treatment		Technic				Immediately After Treatment		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts ac	Volts dc	Milliamps. ac	Milliamps. dc	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	28	46	16	45	12	14-16	50	46		45
2	51	44	4	52	10	8-14	55	44		45.5
3	45	33	2	22.5	8	10-18	60	34		33
4	43	32	4	24	12	15-19	54	33		32
5	48	22	2	25	8	16-22	42	22		27.5

3. From the General Electric machine "no" contraction to "good" contraction was elicited.

4. In a second series, the current used was made the same for the two machines at 20 cycles per second.

5. Contractions from "slight" to "good" were elicited from the General Electric machine at a frequency of 20 cycles per second.

6. "Good" contractions were elicited from the CD 7 at this frequency.

7. Current tolerated for the CD 7 was slightly higher than for the General Electric machine.

8. In the third series, the milliamperage which could be tolerated at a frequency of 20 cycles per minute, with uninterrupted direct current, were compared with alternate polarity (unmodulated, continuous, slow sinusoidal).

9. It was found that the tolerance was equal within the accuracy of the experiment.

10. The ripple voltage was measured in one sample of each machine. It was found to be slightly higher in the General Electric machine. The difference appears hardly significant.

EXPERIMENTAL DATA

In order to evaluate whether average clinical electrical stimulation will produce noticeable fatigue, the following tests were done on normal human subjects. Subjects 1, 2, and 3 in all tests are the same individuals.

In all experiments the duration of the electrical stimulation was fifteen minutes.

Test I: D.C. positive pad was placed under the right shoulder, A.C. on triceps, A.C. on forearm, D.C. negative on the palmar surface. A.C. sine surge 2,000 cycles per second at a frequency of 60 per minute. D.C. continuous full wave, at a frequency of 60 per minute and pulsations 120 per second. *(See Table 4.)*

Test II: Two-pad technic—two pads, dispersive on triceps, active on flexor muscle bellies of forearm. A.C. sine surging 2,000 cycles per second modulated at 60 per minute. *(See Table 5.)*

Test III: Slow sinusoidal—D.C. alternating polarity with pulsations (120 per second, surges 10 per minute). *(See Table 6.)*

Test IV: A.C. rapid sine at 2,000 cycles per second modulated at 60 per minute. Pressure cuff placed on upper arm in position normally used for taking blood pressure readings, with a pressure of 50-60 mm. mercury maintained during stimulation period. Dispersive electrode was placed under the forearm. *(See Table 7.)*

TABLE 5—TEST II

Subject	Before Treatment		Technic		Immediately After Treatment		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	29	44	4	8-12 14-16	35	40		41.5
2	44	44	8	10-14-16	47	45.5		45.5
3	43	34	5	8-10-12	41	34		33
4	29	45	6	12-14	29	44		44
5	52	41	4	10-12 16	52	41		52.5

TABLE 6—TEST III

Subject	Before Treatment		Technic		Immediately After Treatment		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	29	43.5	22	26	30	43		43.5
2	26	41.5	25	24	30	45		45
3	28	35	26	35-39	28	55		55.5
4	45	27.5	22	22	35	32		31
5	42	23.5	24	28	40	23.5		25

TABLE 7—TEST IV

Subject	Before Treatment		Technic		Immediately After Treatment (With Cuff & Press)		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	29	46.5	8-10	12-15	35	46	30	46.5
2	29	40	8	15-16	29	41	30	40
3	92	35	9	12-16	34	35.5	34	35.5
4	28	33	14	12-13	29	34	26	33.5
5	40	39	8	14-15	35	37.5	28	38

TABLE 8—TEST V

Subject	Before Treatment		Technic		Immediately After Treatment		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	30	44.5	8	20-22	29	40.5	30	44.5
2	28	42	10	18	30	42	30	42
3	30	32	6	14	30	32	29	32
4	33	27	6	18	33	22	27	24
5	24	33	6	18-19	23	31.5	24	31
6	37	29	4	15	28	30	29	31
7	27	29	4	18	28	29	29	31.5
8	37	22.5	4	12	40	19	40	19

Test V: A.C. rapid sine at 2,000 cycles per second modulated at 60 per minute. Hand was weighted by a 5-lb. DeLorme-type weight tied in the open palm by means of an Ace bandage. *(See Table 8.)*

Test VI: A.C. rapid sine at 2,000 cycles per second modulated at 60 per minute. Weighted in the above described manner by means of a 10-lb. weight. *(See Table 9.)*

Test VII: A.C. rapid sine at 2,000 cycles per second modulated at 60 per minute. Pressure cuff applied as described in Test IV, and a 5-lb. weight applied as in Test V. *(See Table 10.)*

Test VIII: A.C. rapid sine at 2,000 cycles per second modulated at 60 per minute. Pressure cuff applied as in Test IV, and 10-lb. weight applied as in Test VI. *(See Table 11.)*

TABLE 9—TEST VI

Subject	Before Treatment		Technic		Immediately After Treatment		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	25	41.5	6	19	35	41.5	29	43
2	32	43	8	22	28	43.5	27	44
3	35	58	7	14	35	58.5	34	58
4	26	59	4	18	25	59	25	58
5	30	55	5	16	29	55	29	60.5

TABLE 10—TEST VII

Subject	Before Treatment		Technic		Immediately After Treatment		10 Minutes After Treatment		Circumference*	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.	Inches Before	Inches After
1	27	46.5	8	17	25	50	22	45.5	9	9
2	29	42.5	12	21-25	35	40	30	40	9¼	9¼
3	28	52.5	12	22	29	50.5	29	51.5	9⅝	9⅝
4	59	55.5	12	16	40	55.5	38	55.5	8⅝	9
5	30	50.5	8	18-20	28	50.5	28	50	8⅝	8½

*Circumference taken 3 inches distal to head at elbow before period of stimulation and immediately following stimulation.

TABLE 11—TEST VIII

Subject	Before Treatment		Technic		Immediately After Treatment (With Cuff & Pressure)		10 Minutes After Treatment	
	Coord. Time Sec.	Strength Kgm.	Volts	Milliamps.	Coord. Time Sec.	Strength Kgm.	Coord. Time Sec.	Strength Kgm.
1	27	36.5	6	18	33	33.5	27	34
2	29	37	19	21	30	40	30	40
3	28	50	14	18-20	28	52	28	34
4	30	29	12	20	31	29	30	29.5
5	35	40	8	18	35	40.5	28	42

DISCUSSION OF DATA

Test I: As the period of stimulation progressed and the muscle contraction appeared to diminish in strength, the current was increased to again bring the flexor muscles to maximum contraction. By the end of the treatment period the subjects said their arms seemed to feel extremely weak, but, when the grip was retested on the dynamometer immediately upon removal of the electrodes, the strength had not diminished. There was apparently no appreciable evidence of fatigue nor loss of coordination.

Test II: One subject reported feeling actual lameness in the muscle group stimulated, the day following. She had not registered any decrement in strength nor coordination following the stimulation period. No appreciable loss of strength or coordination was registered as a result of the stimulation.

Test III: One patient, whose diastolic pressure

was below 70 mm. mercury (*subject 2*), experienced extreme discomfort when the pressure was maintained at 60 mm. mercury. It was therefore dropped slightly, but the signs of constriction were maintained, i.e., outstanding veins below the constriction, blue-red color of the skin, cyanotic tinge to fingernails. No significant evidence of fatigue was registered as measured in these tests.

Test IV: No evidence of fatigue.

Test V: More evidence of fatigue, with four subjects registering a decrease in strength after the stimulating period, with three of them still not back to their original tested strength after a ten-minute period.

Test VI: No significant evidence of fatigue.

Test VII: One subject (1) showed what might be really called "fatigue" on the strength test.

It was thought there might possibly be a change in the circumference of the forearm with an increase occurring after the period of stimulation. This would comply with work already done, which demonstrated that exercise of muscles on an arm or leg brings about a temporary increase in the girth of that member, usually lasting from fifteen to thirty minutes. However, measurements taken three inches below the bend of the elbow before stimulation and again immediately after, showed no appreciable increase. Therefore, the measuring was discontinued.

Test VIII: Although subjective fatigue and discomfort were mentioned, no appreciable evidence of fatigue as such was recorded on the dynamometer or coordination test board. With the pressure still applied during the tests given immediately after treatment, the subjects complained of awkwardness of elbow flexion in the attempt to assume the flexed arm position in order to take the coordination test.

The problem of fatigue by electrical stimulation has received considerable clinical attention without a critical analysis of its real value. The above experiments were developed to evaluate its importance in clinical practice. Therefore, a simple clinical test has been used in preference over more elaborate methods (dynamometer, electromyography).

The question of psychological effect of the electrical stimulation may enter here. Does the patient come to believe that his muscles should feel tired after witnessing their constant working over a fifteen minute period, and subconsciously relax more completely as a whole? Subjectively, the feeling of fatigue was present, yet, objectively, the tests for fatigue indicated very little. The possibility of differences in the production of fatigue in innervated and denervated muscles by electrical stimulation must not be forgotten.

SUMMARY AND CONCLUSIONS

1. A variety of tests of electrical stimulation to normal human muscles was done in an attempt to produce fatigue which might be objectively measured by simple and obvious clinical methods.

2. No appreciable loss of strength or coordination, nor increase in girth of muscle-groups stimulated, were recorded.

3. This was a clinical-type test and must be considered as only a beginning in the attempt to ascertain the value of electrical stimulation in fatigue-production in human muscle.

4. No evidence was found to substantiate the clinical impression that electrical stimulation might be damaging to muscle function because of fatigue caused by this type of stimulation.

5. There appears to be no evidence to support the suggestion that electrical fatigue could be used to decrease spasticity in upper motor neuron lesions.

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The Role of the Physical Therapist in the Total Care of the Child*

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I was at first reluctant to accept your invitation to speak at this national meeting of your organization, since I had little to add to your knowledge of technics of physical therapy. However, since pediatricians are destined to play somewhat of a central role in the care of children, I thought it might be advisable to discuss with you some problems common to all who are charged with child care at one time or another.

It is a source of considerable pleasure to me to have an opportunity of meeting with this group of physical therapists today. In some small way I hope these meetings provide recognition and demonstrate our appreciation for the outstanding services which physical therapists have rendered to children. It has been my fortunate experience to have observed members of your organization bearing the brunt of professional responsibility and services, under critical emergency situations in poliomyelitis epidemics, at great personal risk and sacrifice far "above and beyond the requirements of duty." In cerebral palsy programs you have established yourselves as mainstays, indeed, often providing leadership in indicating to those of us in related disciplines what might be within the realm of accomplishment. Certainly in pediatrics we are indeed indebted to you for your loyalty, perseverance, and professional skill.

In this year of the Midcentury White House Conference on Children and Youth it is well that all of us in the professions concerned with children re-evaluate our activities in order that our future work may be most effective. Although we could discuss some specific problems of clinical management, I believe that the integration of all our clinical information is becoming more important. Thus, for the first time, the White House Conference is to be not a collection of technical experts, but rather a gathering of all people concerned with the rearing of children. With the control of infectious diseases, a better knowledge of nutrition, and increasing concern over the relatively high incidence of mental ill-health in our population, the theme of the conference has become "healthy personality development" for all children in a democracy. Since this touches so intimately upon the subject I desire to discuss with you, I can not help but relate the conference to this meeting.

The increasing specialization of all professional groups, which has accomplished the vast increase in information flowing from research, has reached a point where it does not always serve the patient to greatest advantage. We have cause, therefore, to reconsider this trend, in order that each of us will not only know what kind of disease a patient has, but, just as significantly, what kind of patient has a disease. Even more significantly, we must learn to pool our professional resources to prevent or minimize the development of disease processes. Toward this end the White House Conference is bringing together all professional groups, citizen representation, and youth itself.

It is my desire to clarify the role which all of us may fulfill in the total care of children and relate this to the professional activities of the physical therapist. In order to bring this out effectively, it will be emphasized over and over again that only through an interdisciplinary approach, in which we all cooperate with and learn from each other, will we achieve our common goal of providing optimal total care for all children.

All professions concerned with child care have a fund of information which should serve as a common denominator. I refer to the information which we generally call child development in its broadest sense. This includes the body of knowledge concerning physical, mental, emotional, and social growth. It is not generally appreciated that this sphere of information is not the vested interest of any single professional or research group.

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*Read at the annual conference of the American Physical Therapy Association, Cleveland, June 1950.

Rather, it has received contributions from the humanities, the social and biological sciences, and certainly from the various medical professions. We must learn to draw upon this information in our daily work in order to serve most effectively. This requires daily integration of the efforts of all of us in order that we may establish interrelationships among various aspects of this information for the best interests of our patients. Only *insofar* as we can facilitate growth and maturation will we assure ourselves of better health for all our people.

Many contributions have been made in recent years to our understanding of physical growth and maturation. These advances have enabled us to understand some of the clinical problems with which the physical therapist is often concerned. We now recognize, for example, that the rapid rate of growth in the first year of life (a tripling of the birth weight and a 50 percent increase over birth length) predetermines the manifestations of nutritional disorders observed. Thus, scurvy, as a result of vitamin C deficiency, or rickets, as a result of vitamin D deficiency, in infancy reflect themselves predominantly in epiphyseal growth disturbances, since these represent areas of rapid growth and cellular activity. The end results of these disorders are well known to you, although, fortunately, they have become much less common since we have become aware of the influence of rapid growth upon nutritional requirements.

Another age period in which rapid growth has many clinical implications, although these are much less commonly appreciated, is adolescence. As in infancy, rapid growth makes many nutritional demands which render the individual more susceptible to certain clinical disorders. Certainly the rapid gain in weight by the addition of muscle mass during these years makes an adequate protein intake of critical importance. The frequent observation of poor posture and flabby musculature in the young adult probably is directly related to the relatively poor protein intake and fatigue of many adolescents in our culture. It should be emphasized that although economic factors may be of some importance, cultural patterns, and particularly dietary fads, often are of even greater significance. I emphasize these factors because one frequently sees a physical therapist working very diligently with adolescents, attempting a program of posture correction which is destined to failure because elementary facts concerning growth and nutrition are not receiving adequate consideration or integration.

In the same light it is necessary to emphasize other nutritional deficiencies which predispose to certain clinical disorders. From the long-term studies of adolescents by Johnston, we now recognize that the adolescent is predisposed to the development of slipped epiphysis when vitamin D and calcium intakes have not been adequate. Indeed, the vitamin D requirement per pound-body-weight, during this phase of rapid growth, is comparable to that of infancy. The more recent studies of Albright and his collaborators, demonstrating the critical role which an adequate protein intake plays in the formation of bone matrix, may provide additional understanding of the predisposition of the adolescent to bony disorders. Again, it is important to point out that treatment, including physical therapy, will not be productive unless careful consideration is given to these nutritional factors.

One may also conjecture about the role of these dietary factors in predisposing the adolescent to idiopathic scoliosis and vertebral epiphysitis. Additional studies are necessary to elucidate these factors more accurately. They are emphasized, however, because it is very likely that, in the past, neglect of their role has contributed significantly to the frustrations which many of you have experienced in the therapy of these disorders in adolescent children.

Although protein, calcium, and vitamin D requirements are of particular importance during the rapid growth of adolescence, I do not mean to minimize other factors. In recent studies we have observed that subclinical deficiencies of other factors occur altogether too frequently. Although their manifestations are not quite so dramatic, they undoubtedly influence growth and developmental patterns. In our therapy we must always return to these fundamental requirements for growth. Thus, in poliomyelitis patients, for example, the daily requirements of water soluble B vitamins not only may not be met, but additional loss may occur through the abundant perspiration associated with hotpacks. Supplementary vitamin administration is of utmost importance under such circumstances. Or, under the same circumstances, if muscle regeneration and hypertrophy are to take place under our therapeutic program, we must provide for the body economy—the wherewithal, in the form of protein intake—in order to develop a positive nitrogen balance with which to build muscle. Or, convalescence and rehabilitation following a fracture may be thwarted by inadequate protein, calcium, and vitamin D intakes in spite of a skillfully administered physical therapy program. In all of these instances we must keep in mind constantly that it is not our objective to supply maintenance requirements only, but that quantities adequate for

growth, in addition to the reparative needs, are essential. Growth is the central factor which sets the pediatric patient apart from all others.

During the past few years we have learned much about the maturation of neuromuscular integration. The work of Charlotte Bühler, Gesell and his collaborators, and others have taught us that this development proceeds in an ordered cephalocaudal direction. Although we could say much about the clinical significance of this information for all of us, there are two points which I should like to emphasize for the physical therapist. First, these normal patterns should be respected in our management of all children. Thus, in our therapy we should not make demands of children requiring greater complexity of neuromuscular integration than is physiologically possible. Success or failure in therapy may hinge on an adequate knowledge of developmental standards and our respect for them. Secondly, in our work with children who have various types of neuromuscular dysfunction, progress may often be achieved if we endeavor to reproduce the pattern of normal neuromuscular maturation, no matter how slowly this occurs. In the management of the cerebral palsied child, for example, the development of reciprocal lower extremity motion as a prelude to walking is well known to you. We must extend these technics in other disorders to facilitate the development of function.

The significance of our understanding of physical and physiological growth patterns may suffer if we do not comprehend as fully the emotional growth patterns of childhood. Whether or not these growth patterns develop in a wholesome fashion will determine to a considerable extent the ability of the individual to assume, ultimately, the adult responsibilities of citizenship. This will in turn determine the character of our nation in the years to come.

Fortunately, the tendency toward maturation is a strong one, even in the face of adversity. As physical therapists, however, you recognize that emotional problems may negate the fulfillment of the prescribed objectives. Unless the emotional problems of the child and parents are given adequate attention, the program cannot be considered a well-rounded one.

We have considered the nutritional requirements for growth of children and the complications which develop when we neglect to meet these requirements. The fact that emotional growth has its nutritional requirements, as well, is not so generally appreciated. I would like to comment briefly upon some of these growth needs.

The foremost need of all children is security. For the handicapped child with whom we are largely concerned, this has far-reaching implications. Feelings of security arise from being loved, wanted, and accepted. The child with a physical defect is sensitive indeed to the subtle rejection of him. In other words, we have not yet developed a real integration of the handicapped into the life of our communities. We are concerned first, of course, with the acceptance of the child within the family circle. This we can facilitate by pointing constantly to the positive achievements which may realistically be attained. The attitude of the family is of course conditioned to a considerable extent by attitudes prevalent in the community. It is important, therefore, if we are to be truly effective, that we exercise our influence in shaping programs for the handicapped which will view them not as objects of charity, but will provide, rather, a wholesome integration into the life of the community. We must particularly insist that in the field of education, as part of the all-too-meagre health education, children be provided with a wholesome understanding of physical and mental disturbances. Ultimately we may look forward to communities which are sufficiently educated and mature to realize that they need the fullest participation, socially and economically, of the handicapped, as much as he needs the community. The dignity of every individual, and man's duty to his fellowman, must become one of the central ideas of our social order. The White House Conference should help make this a reality.

Another important building block for the development of emotional maturity is the provision of appropriate stimuli for maturation. The handicapped child is often placed in the position of either having too much or too little expected of him. The tendency for regression to take place in response to overprotection and infantilization of children during illness should be particularly avoided. In this setting a consideration only of chronologic age is of relatively little value. Recognition of the child's capacities and the parental attitudes are much more significant in planning a program. Dr. Kendell and I have recently had some experiences which are illustrative of the point which I am trying to make.

Francis, a ten-year-old boy, experienced a severe attack of rheumatoid arthritis four years ago. He was the only child of well-meaning parents who were somewhat older than average. They were very concerned and protective of the boy, who apparently derived considerable satisfaction from the attention and overindulgence he received. He ultimately did less and less for himself until he could no longer sit up or feed himself. We know

that it has been a long time since this boy has had any activity of his arthritic process. We feel certain that much of the deformity could have been minimized had his parents been provided with sufficient counsel to guide this boy in the direction of independence rather than dependence. Now his rehabilitation program will extend over years and will be very costly; unfortunately the prognosis will still remain poor.

In the second instance we observed a seven-year-old boy with severe Oppenheim's disease. On the basis of neuromuscular performance we would classify him at a level of approximately eighteen months. Intellectually, he is precocious and has a mental age of about eleven years. Emotionally, he is approximately at his chronologic age. Obviously, to guide this boy properly—to provide appropriate compensatory activities for his motor retardation and proper stimulation for his intellectual precocity while at the same time providing for his emotional needs—requires skillful professional care. Having received such care, this boy is maintaining a school program and making some progress against what seem to be insurmountable odds. The difference between these two children is in the professional teamwork resulting in proper care and parental guidance. This boy's parents have learned to appreciate the importance of his emotional development. This, in turn, has simplified his program of physical therapy.

In the management of patients the physical therapist has a strategic position on the medical team. But none of us on this team can perform without the support of other professions. No single profession can be considered to possess the ultimate answers for all patients. We in our departments of physical medicine and pediatrics have the feeling that only as we work together, with the nurses, nutritionists, social workers, psychologists, psychiatrists, educators, and other professional groups, can we provide most effectively for our patients. And we make a strong plea for the joint staffing of clinics caring for children in order that we may develop a truly interdisciplinary approach for the best in patient care. In the process, the physical therapist begins to talk more like the nutritionist, the nutritionist learns the language of the physical therapist, the physiatrist becomes more of a pediatrician and psychiatrist and vice versa, and so on down the line until we all talk very much the same language, that of total child care.

As our programs become more fully developed and all-inclusive, as we train personnel in more adequate numbers, and as advances in research minimize the more formidable problems—such as rheumatoid arthritis, perhaps even poliomyelitis, and, to some extent, cerebral palsy—we may look forward to the day when physical therapy will concern itself more and more with a positive health program. Detection of minimal disorders, the prophylactic value of physical therapy in helping to prevent postural and other musculoskeletal disorders, and a better understanding of neural, muscular, and skeletal physiology will emerge as greater contributions to the health of our people. Thus physical therapists may take their places in fulfilling the objective of the White House Conference in determining how we can develop in children the mental, emotional, and spiritual qualities essential to individual happiness and to responsible citizenship, and what physical, economic, and social conditions are deemed necessary to this development. In this process we do not lose our identities as professional people, but rather we can bring into focus more clearly how each of us may contribute most effectively to the whole.

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A Clinical Study of Testing and Treatment of Peripheral Vascular Diseases*

James E. Griffin, M.A., and Herbert H. Jones, R.N.

The group of disabilities which are due to circulatory disturbance is not new to the physical therapists. This paper has the twofold aim of showing (1) how physical therapists can make themselves useful to the doctor in diagnosis, and (2) the patient's response to treatment in a physical therapy section of a Department of Physical Medicine and Rehabilitation. The conclusions herein are based upon the results of the testing and treatment of fifty-two male patients suspected of having some form of the peripheral vascular diseases.

Procedure

Besides the taking of the personal history and the physical examination performed by the doctor, certain tests may be done by the physical therapist to help to determine the severity of the disease and attempt to determine if the condition is due to vasospasm or organic occlusion, and whether it be limited to one or more of the extremities. The tests are also good indexes of the patient's response to treatment. In this report three tests are used: skin temperature test, Landis-Gibbons reaction, and the oscillometric index.

The skin temperature test is an indirect means of measuring the amount of blood flowing freely through a given area. If vessels are partially occluded or in spasm, or if there is stasis, circulation will be impaired and the temperature of the involved area will be lower than normal. Normal is here considered to be at or above the room temperature (72°F).

The skin temperature test requires:

1. A draft-free room with constantly controlled temperature and humidity
2. A device such as an electrical thermocouple, capable of measuring slight temperature changes of small areas of skin

The Landis-Gibbons reaction is indicative of whether the circulatory impairment is primarily occlusive or vasospastic in origin. The test is based on the fact that a local application of heat will create a generalized vascular response if impairment is due to vasospasm. Our routine is to use water of 115°F for fifteen minutes. The temperature of the extremities being tested may rise considerably, stay approximately the same, or drop, depending upon the degree of occlusion.

The Landis-Gibbons test necessitates:

1. The measuring of skin temperature of toe or finger tips, as in the skin temperature test
2. Reflex heating of the extremities to be tested, by placing the other pair of extremities in water of a standard temperature for a regulated period of time
3. Repeating the measurement of the temperature of the toe or finger tips

The oscillometric index is an indirect measure of the degree of elasticity of blood vessels, and hence their ability to meet the demand for a greatly increased blood supply to an area, as in exercise. This measurement is based on the fact that, shortly after the cardiac systole, the arterial tree must expand to take care of the influx of blood. When a pneumatic cuff of an oscillometer is applied to the extremity and the pressure decreased sufficiently to permit the blood to be forced through, the pulsation will be registered on the oscillometer. As the pressure is further decreased, the pulsations become larger, then become less, and finally disappear. That which is maximal is the oscillometric index. When arterial elasticity is lessened, the pulsation is less in intensity and occurs at lower pressure.

The oscillometric study requires:

1. An instrument to determine blood pressure
2. A means of shutting off all blood flow to and from an extremity but capable of recording pulsation of the arteries when the pressure is lowered enough to permit blood to flow (Sphygmo-oscillometer meets these criteria.)

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*Read at the annual conference of the American Physical Therapy Association, Cleveland, June 1950.

When these basic tests show that an increase of blood flow is necessary for relief of the symptoms, three other tests may be used to help determine the most effective method to increase blood flow. These are attempts at vasodilatation with (1) the sympathetic block, (2) oral administration of "priscoline" (a drug with vasodilating effect), or (3) heating the splanchnic area of the body for reflex effect by use of the "Moistaire" heat therapy unit. The effect of each of these methods on the individual may be closely followed by measuring skin temperature and oscillometric index changes immediately before and at stated intervals after the procedure.

TREATMENT

The treatment of the patient was based on results of the physician's physical examination and interpretation of the tests. One or more of the following methods of treatment were used on each patient, intermittent venous occlusion, use of "Moistaire" heat therapy unit* for reflex heating, "Contura"† glycerin-impregnated bandage with "Ace" bandage, ultraviolet irradiation, whirlpool bath, ion transfer, Buerger-Allen exercises, and heel-toe walking training. Due to space limitations, only three of these methods will be described.

1. Intermittent venous occlusion is the mechanical stopping of venous flow alternated with periods of free flow from an extremity. Since arterial flow is not interrupted, the arterioles and capillaries are forced to dilate. A pneumatic cuff is placed high on the proximal portion of the extremity to be treated and attached to an apparatus that automatically inflates and deflates the cuff at prescribed pressure and interval. The physiatrist prescribing this treatment is of the opinion that, "Intermittent venous occlusion, to be effective, must be used over an extended period of time, preferably a minimum of two hours daily for at least six months. There are no contraindications for its use in any type of peripheral vascular disease, including lesions of an inflammatory nature. Intermittent venous occlusion is chosen when the peripheral vascular disease is generalized and primarily arteriosclerotic."

2. Another measure used to produce vasodilatation of the peripheral circulation is reflex heating. Our method is to enclose the splanchnic region of the body in the "Moistaire" heat therapy unit at temperatures of 115-118°F for forty-five minutes. This causes a rise in skin temperature of up to 10 degrees in the extremities; this can be demonstrated by testing. The effects last from two to eight hours. There is no appreciable rise in oral temperature. This treatment is prescribed when the disturbance is primarily vasospastic, or limited to a part of an extremity as in Buerger's Disease, or, when trophic ulcers are present, where it has become the treatment of choice.

3. "Contura," glycerin-impregnated bandages, are used in the Department whenever edema occurs with peripheral circulatory impairment. The technic of application is first, to protect the bony prominences and pressure areas with vaseline gauze; second, anchor the bandage at the ankle with a figure eight, and, spiralling around the foot, use a rapid spiral up the leg to the tibial tuberosity, and then spiral slowly down to the ankle again. No pressure is applied when this bandage is wrapped. Then apply the "Ace" bandage over the "Contura" with the same technic as above, but using firm, even pressure. The "Ace" bandage is changed daily to maintain steady pressure. The glycerin-impregnated bandage is changed once a week or sooner, if the decrease in edema creates slack. The principle of this form of treatment is to open up collateral circulation by the use of mechanical downward pressure.

Buerger-Allen exercises and heel-toe walking instruction are ordered routinely on all patients with peripheral vascular diseases. The Buerger-Allen exercises are prescribed individually, with emptying and filling time closely checked at least once a week with any necessary changes being made.

RESULTS

The results of the testing and treatment of fifty-two patients, suspected of having some form of a peripheral vascular disease, are given. All had a minimum treatment of two weeks' duration; the maximum treatment was fifty-three weeks; the average, fourteen weeks. Some patients who have shown clear-cut improvement by tests and subjective examination are being continued in hopes of obtaining maximal results.

The patient is regarded as improved if one or more of the tests showed increased circulation on repeat tests. If a trophic ulcer was present, and is healed, the patient is designated as improved.

If the disease progressed, there was a clear-cut drop in skin temperature and oscillometric studies. In several cases, amputation followed when all treatment failed. In two cases death occurred from other causes.

Twenty-five patients had arteriosclerosis obliterans with or without complications, such as diabetes or heart disease. Sixteen improved; in four the disease progressed; five had insufficient number of tests or treatments.

*Moistaire—heat therapy unit—Ritz Corporation, Pittsburgh 6, Pa.
†Contura Bandage—Medical Fabric Corporation, Paterson 1, N. J.

Of these twenty-five patients, eight received intermittent venous occlusion as primary treatment (Seven improved.); nine received reflex heating as primary treatment and improved. Of the three that received glycerin-impregnated bandages as primary treatment, all improved; three received both intermittent venous occlusion and reflex heating. (Two improved, and in one case the disease progressed.) Two cases received only Buerger-Allen exercises and heel-toe walking instruction. (One patient improved, and in one case the disease progressed.)

There were eight cases of Buerger's Disease. Three of these improved, in two cases the disease progressed, and three had an insufficient number of tests or treatment. Of the five cases of Buerger's Disease which were treated, three received both intermittent venous occlusion and reflex heating (One improved, and the disease progressed in one case.); one received intermittent venous occlusion only and improved; one received Buerger-Allen exercises and heel-toe walking instruction and improved.

There were six cases of phlebitis, including lymphangitis and thrombophlebitis. Five of six cases improved; one had insufficient tests or treatment to be considered. All of the cases of phlebitis had "Contura" bandages applied. Three of these cases also received intermittent venous occlusion, and in addition, one case received reflex heating.

There were seven cases of venous insufficiency. Glycerin-impregnated bandages were used. All these cases showed improvement.

There was one compound fracture with soft tissue damage. The patient improved by the use of whirlpool and appropriate foot exercises.

There were three patients whose symptoms were demonstrated to be on a psychogenic basis; these were not treated for a peripheral vascular disease.

Only five of the fifty-two patients had "aspirin" prescribed, which is a well-accepted vasodilator, and only seven patients received oral "priscoline." It is difficult to evaluate the effect of medication on these patients, but five of the group receiving "priscoline" improved and two cases did not improve.

The average age of these patients was just under fifty-seven years. The youngest was twenty-eight, and the oldest seventy-six. As we know, peripheral vascular disease is not confined to the elderly. A majority of the patients were not started on treatment when symptoms first appeared; in most cases several years had elapsed before the patient entered a hospital because of the disease. This, plus the fact that most of the patients had other diseases, such as diabetes, and heart disease, in addition to the peripheral vascular disease, probably slowed the response to treatment. Inasmuch as arteriosclerosis obliterans is a slow, progressive, degenerative disease, whereas the other conditions are of more rapid onset and likely to follow a speedier course, either toward improvement or toward progression of the disease, change for better or worse appears more slowly.

SUMMARY

1. There are three basic tests which a physical therapist can perform that are useful to the physician as diagnostic aids and indexes of response to treatment, namely:

a. Skin Temperature Test
b. Landis-Gibbons Reaction
c. Oscillometric Index

2. There are three other diagnostic procedures in which skin temperature and oscillometric studies are helpful. They are attempts at vasodilatation by: (1) sympathetic block, (2) oral administration of "priscoline," and (3) heating the splanchnic area of the body for reflex effect by use of the "Moist-aire" heat therapy unit.

3. Treatment of peripheral vascular diseases has been discussed. The modalities used are intermittent venous occlusion, reflex heating, ultraviolet light, ion transfer, whirlpool, glycerin-impregnated bandages, Buerger-Allen exercises, and heel-toe walking instruction.

4. The results of such testing and treatment have been discussed. Our department feels the aforementioned modalities help to improve peripheral circulation if continued over a period of time.

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A Simple Splint with Knee Cap As an Aid in Pre-Crutch Training

Morton Haberman, M.D., and Erbert F. Cicenia

As a result of the long delay frequently encountered in obtaining braces, it is sometimes necessary to improvise equipment to fulfill the immediate weight-bearing and ambulation needs of the patient. The delay is usually accentuated during and after severe epidemic seasons of anterior poliomyelitis, when the backlog of brace orders may increase tenfold. At the New York State Rehabilitation Hospital, where all types of disabled patients—poliomyelitis, cerebral palsy, myelitis of various types, arthritis, etc.—are administered for definitive treatment, a simple splint with knee cap has been utilized most effectively during the past year. The rehabilitation program of a large number of cases, involving the loss of use of one or both lower extremities, has progressed during the interval between ordering and receiving of braces, as a result of the use of this splint. The temporary use of this splint has been one of a number of the contributing factors which permitted us to treat greater numbers of severely disabled patients without a proportional increase in personnel. (Other factors, such as group therapy programs for similarly involved patients, will be reported at a later date.)

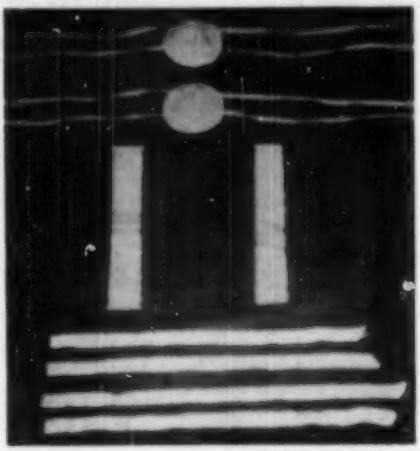

Figure 1. Top Row: Canvas knee caps with extra length "tails." Middle Row: Bandage-covered wooden splints. Lower Row: Binding straps.

Physical Rehabilitation Section, Department of Physical Medicine, Rehabilitation Hospital, West Haverstraw, N. Y.

Psychologically, of course, the patient's morale is given a tremendous boost when he assumes the upright position after a more or less prolonged period of bedrest. Since we have been using the splint, the incidence of psychological letdown, usually seen during the period between the time when the patient is ready for upright exercises and the time braces are finished, has decreased considerably. Since practically all of the balance, preambulation, ambulation, and elevation exercises can be given with the use of the splint, it makes little difference whether it takes three weeks or eight weeks for the completion of the braces.

The physiological reasons for early weight-bearing in severely involved patients have been reported by a number of competent investigators. The use of this splint in weight-bearing has been a natural progression from tilt-table weight-bearing which we have been using for the past three years.

The use of the splint is similar in principle to that of a knee cage or brace. In 1946 Dr. Deaver described a special knee brace to prevent or correct knee flexion deformities, which was also found useful as a support for weak quadriceps in ambulation. We prefer to use the splint, since we have found it most difficult to keep a knee cage or brace in proper position, especially on a flail or markedly atrophied extremity, unless made with a long lateral strut extending to the shoe. Of course, the use of such a knee cage or brace is then a matter of brace construction and again involves delay, which we wish to avoid.

The splint consists of a light sturdy section of

wood cut in a number of different sizes so that the department can have a number on hand to meet the needs of the patients awaiting braces and requiring temporary support for weight-bearing or balancing. We have been using half-inch plywood successfully, but the thickness must be dependent upon the weight of the patient. The size of the splint varies with the length and width of the patient's lower extremity. The desired length should extend from approximately two inches below the gluteal fold down to at least two inches above the malleolus. The width should be broad enough to permit the splint to lie firmly against the posterior aspect of the limb. To provide a padding effect to the splint surface, it is covered with two-inch roller bandage. *(See Figure 1.)*

The splint is placed over the posterior part of the limb and held in place by webb strapping or other material, tied or buckled at the lower portion of the thigh and the mid-portion of the lower leg. To prevent the knee joint from buckling, the knee is kept in extension by a simply constructed knee cap of canvas. In an emergency, a "four-tailed bandage" with extremely long tails can be used for knee support until a more satisfactory knee cap is obtained. Straps from the knee cap encircle both the leg and the splint, and are tied or buckled over the anterior aspect of the leg, above and below the patella.

The primary use of this simple splint is in aiding patients to bear weight and in teaching pre-ambulation activities on parallel bars, or on crutches, during the construction of a brace. *(See Figure 2.)*

Figure 2. Patient using splint with knee cap, bilaterally, as an aid in the re-establishment of balance and weight-bearing activities in the parallel bars.

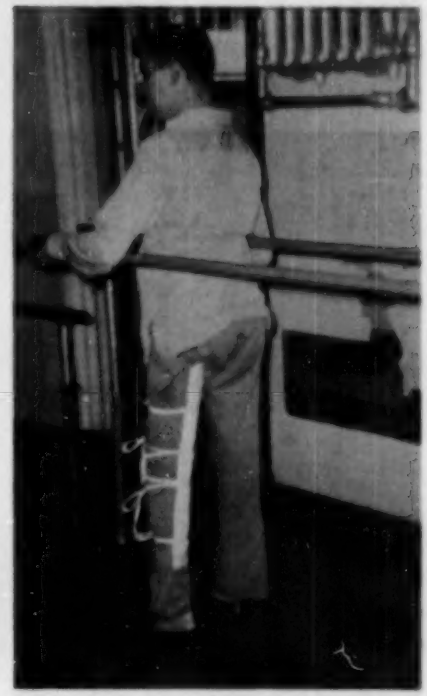

Figure 3. Splint with knee cap being used to evaluate the functional ambulation potential of a severely involved post-poliomyelitic patient.

The splint has also been used successfully as an aid in evaluating the functional ambulation potential of certain patients, before undergoing the expense of procuring braces. In other words, in certain severely involved patients, splints have been used to place the lower extremities in the same alignment afforded by braces, in order to determine whether or not the patient will be helped or handicapped by the use of braces. *(See Figure 5.)* After a given period of intensive treatment, if the patient demonstrates the necessary musculature and balance for functional ambulation, braces are ordered.

Occasionally, in the after-treatment of poliomyelitis, some patients attain a temporary level in their recovery when weight-bearing is desired, but ambulation is contraindicated. Gains made in increasing the strength and flexibility of specific muscle groups can be lost if these muscles are unduly fatigued, or if ambulation is attempted too soon. By the same token, at this level it may also be too early to determine whether a brace will be indicated, or, if indicated, what type of brace should be ordered. Still, for physiological and psychological reasons it is important to have the patient begin weight-bearing. In these cases, our patients are sent to the clinic for standing, only. Standing is a balancing technic and can be taught with a minimum of strain on weak muscles. In order to prevent the knee from collapsing if the body deviates from the established point of balance, to prevent the joint from assuming a position of recurvatum, and protect weak muscles, use of the splint with knee cap is recommended.

Figure 5. Bilateral splints with knee caps used in performance of functional activity: "Sitting down and getting up from chairs."

Figure 6. Use of splint with knee cap, bilaterally, as an aid in teaching crutch balance.

As has been mentioned, in addition to facilitating and expediting standing and balance retraining, the splint has been found useful in teaching the entire gamut of activities in progressive ambulation, including the following progressions *(See Figures 4, 5, 6, and 7.)*:

I. Parallel Bar Activities
   - A. To and from Wheelchair and Parallel Bars
   - B. Balancing Progressions
     1. Point of Balance
     2. Body-weight Shifting
   - C. Exercises
     1. Push-ups
     2. Hip Raising and Leg Swinging
     3. Special Resistive Exercises (e.g., for hypertrophy of the latissimus dorsi)

Figure 6. "Getting down and up from floor" performed with bilateral splints with knee caps.

D. Elementary Gait Training
   1. Swing-To Gait
   2. Swing-Through Gait
   3. Four-Point Gait
   4. Backward Gaits
   5. Sideward Gaits
E. Pre-Elevation Activities on Stairs and Curbs (utilizing different sized benches or stools placed between the parallel bars)
F. Crutch Management in the Parallel Bars
   1. Crutch Stance
   2. Balance Drills
   3. Body-weight Shifting
   4. Crutch Placement

II. Crutch Management Activities
   A. Correct Crutch Stance
   B. Balance and Body-weight Shifting
   C. Crutch Placement
   D. Basic Gaits
   E. Functional Activities
      1. Sitting Down and Getting Up from Varied Sizes of Chairs
      2. To and from Bed and Crutches
      3. To and from Toilet and Crutches
      4. Getting Down and Up from the Floor
      5. Elementary Falling Technics

The two problems which interfere with and limit the use of the splint with knee cap are that the splint fails to correct drop-foot and fails to correct rotation of the lower extremity at the hip, when these conditions are present. These shortcomings may restrict the amount of gait training the individual can be taught on crutches. However, this is not so serious as to rule out the possible use of the splint, for, within the parallel bars, the patient has little difficulty in controlling the above noted defects to an extent enabling him to practice and learn the basic gaits at this level. Usually, when the patient has progressed to the level when these points of poor alignment begin to manifest themselves and interfere with his advancement, the braces are completed and received from the brace shop. In addition, drop-foot can be corrected to a degree by attaching a strong elastic band or rubber inner tube to the splint and foot.

The splint is usually inapplicable to patients with severe spasticity of the type observed in some spinal cord and cerebral injuries. In spite of this disadvantage, we have recently applied the splint satisfactorily to some of our cerebral palsied children. This has enabled us to begin their functional habilitation training much sooner, while awaiting a more proper and permanent type of appliance.

Figure 7. Performance of functional activity utilizing splint with knee cap, bilaterally: "Ascending and descending curbs."

CASE HISTORIES

The following case histories are offered in an effort to illustrate the practical application of the described splint as an adjunct in the preambulation training of certain disabilities during the period of brace construction.

Case No. 4777 Date of Birth: 4-2-44

Diagnosis: Poliomyelitis, 1949

Disability: Flail right lower extremity, very weak left lower extremity

Appliances Used: Bilateral long leg braces with pelvic band and full-length, adjustable crutches

Braces Ordered: 3-18-50. Braces Received: 5-2-50

Splints with Knee Caps Used: from 2-27-50 to 5-3-50

NEW YORK STATE REHABILITATION HOSPITAL

No. 4777 3-19-50

LEFT	MUSCLE OR GROUP	RIGHT
N	Face	N
	Head and Neck	
N	Flexors	N
N	Extensors	N
N	Lateral Flexors	N
N	Rotators	N
	Trunk	
F+	Flexors	F+
N	Extensors-upper	N
F	Extensors-lower	F+
P+	Rotators	P+
P+	Lateral Flexors	P+
	Hip	
G	Elevators	G
P—	Flexors	T
P	Extensors	T
T?	Abductors	T?
P	Adductors	O
P—	Internal Rotators	O
P—	External Rotators	O
	Knee	
P—	Flexors	O
T	Extensors	O
	Foot	
O	Anterior Tibial	O
O	Posterior Tibial	O
P—	Peroneus Longus	O
P—	Peroneus Brevis	O
F+	Calf	O
	Toes	
T	Flexor Longus	O
G	Flexor Brevis	O
G	Lumbricales	O
P	Extensor Longus	O
	Great Toe	
P—	Flexor Longus	O
G—	Flexor Brevis	O
P—	Extensor Longus	O
P—	Extensor Brevis	O

Case No. 4777. Muscle Chart of Lower Extremities

Treatment Aims During Utilization of Splint with Knee Cap, Bilaterally: Standing balance in parallel bars, crutch balance, gait training

Muscle Examination: a. Date: 5-19-50
b. Upper extremities, apparently normal
c. Muscle chart, lower extremities

Case No. 4329 Date of Birth: 2-15-30

Diagnosis: Poliomyelitis, 1948

Disability: Extreme degree of paralysis of trunk and all four extremities, associated with tremendous amount of atrophy

Appliances Used: Right Opponens Splint, Corset Support, Wheelchair

Treatment Aims During Utilization of Splint with Knee Cap: For evaluation: to determine whether support of the lower extremities, such as could be given by light-weight braces, will enhance the possibility of this patient becoming ambulant. Check standing balance with bilateral splints with knee cap, within parallel bars. When and if balance is attained, check ambulation potentials with splints.

Muscle Examination: a. Date: 5-1-50
b. Muscle chart, upper extremities
c. Muscle chart, lower extremities

SUMMARY

A simple, easily constructed, readily obtainable splint with knee cap has been described. Its uses, advantages, and disadvantages have been discussed briefly. Illustrative cases for utilization of the splint have been given.

It is hoped that the splint with knee cap will be of some assistance to others in the profession, especially those who have found themselves handicapped, in their efforts to rehabilitate the severely disabled, by limited personnel and the usual bracing problem.

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NEW YORK STATE REHABILITATION HOSPITAL

No. 4529 12-1-49

LEFT	MUSCLE OR GROUP	RIGHT
	Shoulder Girdle	
P	Elevators	T?
O	Depressors	O
O	Abductors	O
O	Adductors	O
	Shoulder	
O	Flexors	O
O	Extensors	O
O	Abductors	O
P—	Adductors	P—
O	Internal Rotators	O
O	External Rotators	O
	Elbow	
T, P+*	Flexors	T, P—
P	Extensors	O
	Forearm	
P—?	Pronators	P—
O	Supinators	O
	Wrist	
P—, T?	Flexors	P—, T?
G, F?	Extensors	F+, P+
G—	Abductors	P—
P	Adductors	O
	Fingers	
G—	Flexor Profundus	F+
G	Flexor Sublimis	F+
F—	Extensors	F
N	Lumbricales	G
F	Dorsal Interossei	F—
F+	Volar Interossei	F
	Thumb	
G—	Flexor Longus	F
G—	Flexor Brevis	F
F	Extensor Longus	F+
F+	Extensor Brevis	F+
O	Abductor	O
P	Adductor	P—
O	Opponens	O

Case No. 4529. Muscle Chart of Upper Extremities

* Bi. BB.
† Rad. sl.

NEW YORK STATE REHABILITATION HOSPITAL

No. 4529 12-1-49

LEFT	MUSCLE OR GROUP	RIGHT
N	Face	N
	Head and Neck	
P+	Flexors	P
P	Extensors	P
P—	Lateral Flexors	P—
P+	Rotators	P+
	Trunk	
P, T	Flexors	P—, T?
T	Extensors-upper	O
T	Extensors-lower	T
T	Rotators	O
T	Lateral Flexors	T
	Hip	
O	Elevators	O
O	Flexors	T?
T	Extensors	P
T	Abductors	P—
O	Adductors	T
O	Internal Rotators	O
P—	External Rotators	P—
	Toes	
O	Flexors	P—
O	Extensors	O
	Foot	
O	Anterior Tibial	O
O	Posterior Tibial	O
O	Peroneus Longus	T
O	Peroneus Brevis	T
O	Calf	P
	Toes	
O	Flexor Longus	O
O	Flexor Brevis	O
O	Lumbricales	O
O	Extensor Longus	O
	Great Toe	
O	Flexor Longus	O
O	Flexor Brevis	O
O	Extensor Longus	O
O	Extensor Brevis	O

Case No. 4529. Muscle Chart of Lower Extremities

Translators Requested

A variety of professional magazines are received in the National Office from many foreign countries. A certain number of these are devoted to physical therapy, while many are medical journals containing some reference to the physical therapy field.

THE PHYSICAL THERAPY REVIEW is anxious to publish abstracts of such articles in order to keep the members of the American Physical Therapy Association fully informed regarding activities in the profession in all parts of the world.

Copies of these publications will be sent to any members willing to submit abstracts of articles containing information of interest to readers of the REVIEW.

If you can translate French, German, Dutch, Spanish, or Portuguese, and would care to participate in this program, send your name, address, and language preference to the American Physical Therapy Association, 1790 Broadway, New York 19, New York.

Editorials

Professional Responsibilities

All of us are well aware of the general shortage and increased demand for well-trained physical therapists. To add to the acuteness of the situation, there is the specific difficulty of filling requests for poliomyelitis emergency needs. This demand has not been unusually great this year. However, we wonder how much the problem could have been alleviated if members had seriously considered their professional responsibility to give service where and when it was needed.

An example illustrates the point well. Jane Smith graduated from an approved school of physical therapy in 1948 under a National Foundation for Infantile Paralysis scholarship. Upon graduation she accepted an emergency poliomyelitis position which terminated in six months. Following this, she returned to college for a year to complete work for her degree. Having graduated in June 1950, she has not felt the necessity for returning to physical therapy although numerous positions have been offered her. Where does this girl's responsibility lie?

Let us consider the matter a bit further. Dr. Richard S. Cabot of Harvard University has published a book on morals entitled "The Meaning of Right and Wrong." He makes early and recurring reference to the idea of "agreements" as being the bedrock of morality—agreements with ourselves or with other people. In accepting a scholarship for training, the student agrees to work for one year under supervision following graduation. Moral responsibility is always a personal consideration based on childhood training and sensitivity to the needs of one's fellow man. Thus the final decision for compliance with the agreement must lie with the individual.

To cite another example of refusal to abide by an agreement, we have a group of new graduates who were alerted for emergency positions. They had stated positively that they would be available, but, when called, they refused to go to spots where they were needed, in spite of the fact that they had not been employed in other positions.

Although moral responsibility is of individual concern, if the lack of acceptance of such responsibility occurs within any large number of persons, it ceases to belong to the individual and becomes a group problem. With regard to the American Physical Therapy Association, such irresponsibility lowers the standard of professional service which it is possible to offer a particular group of patients. It is generally conceded that physical therapy is the most important treatment of the convalescent poliomyelitis patient. If adequate personnel is not available, the patient does not receive the proper treatment to which he is entitled. When standards are lowered, as necessarily happens when existing personnel is overworked, the work of many years of building them up is jeopardized.

Regarding the many members who are accepting their professional responsibilities by doing good jobs in the positions where they are needed, it is evident that their responsibilities have been met. The problem with some of them may be one of a feeling of divided duty as exemplified by the physical therapist who must decide whether to go into the armed forces or remain in his present civilian teaching position. The decision may not be easy. It seems that a good criterion on which to base any such decision and one which may apply to each of us in many situations is an answer to the question "Where can I be of most service to the most people?"

—Mary C. Singleton, *President*
American Physical Therapy Association

Vocational Guidance Material

Your attention is called to two informative articles regarding physical therapy, published in the April 17th edition of Weekly News Review and the May 22nd edition of The American Observer. These publications are widely distributed to high school students in all parts of the country. It is suggested that any high school student requesting information be referred to these periodicals.

Both publications are produced by Civic Education Service, Inc., 1733 K Street, N.W., Washington, D. C.

Association Activities

Chapter News

Kentucky: The Kentucky Chapter of the American Physical Therapy Association, under the auspices of the Kentucky Chapter, National Foundation for Infantile Paralysis, presented a state-wide symposium on poliomyelitis recently. This symposium was held at the General Hospital in Louisville, and was given, by request, for doctors, nurses, physical therapists, occupational therapists, and allied personnel throughout the state. Approximately one hundred interested persons attended this interprofessional program.

Lectures included "Hot Packs and the Polio Bed"; "Isolation Technic," Sister Dorothy Bolongie, R.N.; "Special Nursing Procedures," Viola Sprout, R.N.; "Signs and Symptoms of Polio," Mrs. Lucy Driver, physical therapist; "Use of the Respirator," John Untereker, physical therapist; "Practices and Application of Physical Therapy," Margaret Tucker, physical therapist; "Home Care and Instructions," Eloise Draper, physical therapist; "Questions and Answers," Dr. Alex Steigman, Professor of Child Health at the University of Louisville.

Eastern Michigan: A special lecture on the Psychological Approach to Treatment in Polio was presented by Dr. Henry H. Sadler, Jr., professor, Wayne University Medical School, at the Chapter's last meeting.

The Director Reports:

There can be little doubt in anyone's mind that we in the United States must plan for a change in our thinking and living due to the Korean situation. We, as physical therapists, will have problems over and above those we must face as citizens.

For some time we have recognized the shortage of physical therapists for civilian employment. Should additional demands be made for the military, we will face an acute situation.

We must keep the schools filled and every member and every chapter must redouble their recruitment efforts. The new brochure is ready. Send for your supply immediately and use them. Chapters should obtain as complete a list of qualified physical therapists as is possible in their areas. This includes those inactive, those who have resigned or dropped membership, and those who have never joined. Chapters may be asked to take leadership in obtaining personnel for civilian installations from among those who would not be eligible for military service because of age and marriage with dependents.

The American Physical Therapy Association is also acutely aware of the position of the man in physical therapy who is ineligible for a commission because the physical therapy corps, by law, is for women physical therapists only. The Association is working on this actively and will report on it in the REVIEW as soon as there is something definite to report.

Each month, in this column, the Executive Director will report to you on national activities. You will be kept as fully informed as is possible. (Remember, there is a time lag since material must go to the printers' at least three weeks prior to publication.) Your support of the Association's programs, both individually and collectively, is what makes them tick. Your questions and comments are always welcome. Help yourself professionally as a physical therapist by participating in and supporting Association activities, both locally and nationally.

—*Mildred Elson*

National Employ the Physically Handicapped Week

President Harry S. Truman spoke on August 9, 1950, at the annual meeting of The President's Committee on National Employ The Physically Handicapped Week. The official observance of this week will begin October 1st. This preliminary meeting was attended by the members of the committee, state governors, and chairman of Governors' Committees from every state and territory. The American Physical Therapy Association was represented by Mildred Elson, Executive Director.

It is of interest to note in regard to this program that the American Physical Therapy Association employs two physically handicapped persons at its national office.

Notice

In the article relating to physical therapy which appeared in the July issue of the AMERICAN MERCURY, reference was made to Henry and Florence Kendall of Baltimore, Maryland. We have been asked by the Kendalls to state this reference was made entirely without their consent or knowledge.

Membership News

Marriages

Anne H. Quattlebaum to I. A. Barnett, Vallejo, California.

Joanne Miller to James Vaughn, Cincinnati.

Sylvia G. Sward, Iowa City, to Norman K. Mills, Albuquerque, New Mexico.

Barbara Schultz of Warroad, Minnesota, to Dr. George H. Gould, Chicago.

Barbara Borden, Dover, New Jersey, to William G. Draper, Hyattsville, Maryland.

Janet Hofer, now Mrs. Janet H. Snyder, Jackson, Michigan.

Josephine Rodriguez of New Orleans, now Mrs. Josephine R. Bragg, Alameda, California.

Nancy B. Lutz of West Medford, Massachusetts, now Mrs. Nancy L. Dunning, White Plains, New York.

Ethel Stefanics, Vandergrift, Pennsylvania, now Mrs. Ethel Vance, Dayton, Ohio.

New Members

The following are newly accepted members of the American Physical Therapy Association:

Mrs. Dorothy H. Funk
Mrs. Janice B. Roberts
Priscilla A. Bartlett
Brenda Lee Buchanan
Jeanne Hastings
Elva G. Piermarini
Joan C. Wilson
Jeanne Cleverly
Margaret Dolan
Lorraine M. Stone
Lt. Margaret E. Mahoney
Mrs. Nancy Bowman Bratt
Sally Hale
Kathleen G. Ohlmann
Joan Secor
Pauline Beck
Mary Jane Crider
Mrs. Jane Hardee
Joan P. Johnston
Nan C. Knapp
Pauline Moran
Carolyn Pope
Barbara M. Shields
Marie D. Sullivan
Birdie McCutchen
Rosemarie Casella
Marion I. Hartman
Yvonne Kratz
Dorothy E. Mitchell
Dolores A. Pucino
Henry Stano
Hazel Wong
Vincent Wilson
Verla M. Bateman
Lloyd B. Hanson
Mrs. Helen L. Emerson
Dorothy C. Nylin
George W. Lawn
Robert Eastmond
James A. Rainbolt
laNeva Potter
Patritia Kelly
Mary Moskrychi
Patricia Ann Morse
Ann Marie Salisbury
Nancy Whitney
Frank L. Monteforte*
Mrs. Mary M. Swanson
Geraldine Ghent
Georgia Jackson
Joyce Mandell
Jacquelyn Ann Peterson
William H. V. Reilly
Lillian B. Stockfleth
Paul E. Neuschwander
Nina M. Tange
Elizabeth Williams
Elizabeth Fisher
George M. Crandall
Mrs. Nancy P. Solander
Emery C. Carper
Robert Green
Garth Taylor
Rebecca Ann Larson

*Student member (University of Texas)

Reprints Available

One free copy of each scientific reprint (except the complete issues of the REVIEW) will be provided upon request to all members, students in the approved schools, and libraries. A small charge is made as indicated for additional copies to members, students, and libraries, and for all copies to nonmembers. The informational brochures are available to all without charge. To obtain reprints write: American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.

PHYSICAL THERAPY
An illustrated brochure, describing the opportunities for a career in physical therapy, with suggestions for prospective students and a list of approved schools for physical therapy training.

OUR ASSOCIATION
An informational booklet on the activities, scope and services of the American Physical Therapy Association.

PHYSICAL THERAPY—*Suggestions for Prospective Students*
Outlines the professional course of study for college students preparing for physical therapy.

CODE OF ETHICS
Ethics for the physical therapist of the American Physical Therapy Association.

ESSENTIALS OF PROFESSIONAL ETHICS IN PHYSICAL THERAPY
MARY E. HASBELL

PERSONNEL POLICIES FOR QUALIFIED PHYSICAL THERAPISTS
Suggestions as to salary, hours, vacations, etc., by the American Physical Therapy Association.

APPROVED SCHOOLS OF PHYSICAL THERAPY
A list of schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

EDUCATIONAL OPPORTUNITIES FOR PHYSICAL THERAPISTS
A list of postgraduate programs offered by the approved schools and a list of specialized courses for physical therapists.

NEW HORIZONS AND NEW RESPONSIBILITIES FOR THE PHYSICAL THERAPIST
HOWARD A. RUSK, M.D.

UNDERLYING MECHANISMS IN SYMPTOMS OF POLIOMYELITIS: *Their Bearing Upon Treatment*
THOMAS GUCKER, JOD, M.D.

THE PHYSICAL THERAPY DEPARTMENT FROM AN ADMINISTRATOR'S VIEWPOINT
JOSEPH P. PETERS

THE DROP PACK FOR MOIST HEAT
ADELINE E. DOING

HOME CARE PROGRAM FOR POLIOMYELITIS PATIENTS
EMIL D. W. HAUSER, M.D., ANTOINETTE RAJER, AND LOUISE REINECKE

(Continued on p. 601)

General News

Women's Medical Specialist Corps Seeks Active Duty Volunteers

An immediate need for dietitians, physical therapists, and occupational therapists has been announced by Colonel Emma E. Vogel, Chief, Women's Medical Specialist Corps, Army Medical Service. The expansion is necessary in order to bring Corps strength up to requirements indicated by current expansion of the Army.

Particularly desired are Reserve officers of the three sections of the Women's Medical Specialist Corps Reserve and dietitians, physical therapists, and occupational therapists who have served on tours of duty with the Army during and since World War II.

Reserve officers will be recalled in grades up through Captain, Colonel Vogel said. They are urged to apply through the Chief of the Military District of the State in which they hold permanent residence, or (if they are members of medical reserve units) through their Organized Reserve Corps unit instructors. The program is entirely voluntary and is a phase of over-all Army planning for the voluntary recall of Reserve officer personnel. Officers recalled will have the opportunity to serve for at least one year and may request tours of duty for two or three years if they desire. Further information and application blanks may be obtained by writing to the Office of The Surgeon General, Department of the Army, Washington 25, D. C., Attn.: Chief, Women's Medical Specialist Corps.

Fulbright Awards Offered to Physical Therapists

The Department of State, under the provisions of the Fulbright Act, has announced approximately 500 awards for United States citizens who will serve as visiting lecturers in institutions of higher learning abroad during the academic year 1951-52. Included in these awards are two which are specifically open to physical therapists.

(1) *Greece:* Training in physical therapy is in the process of development in Greece. An award is offered for a visiting lecturer to take a leading part in curriculum planning and instruction. Applicants should have advanced training in physical therapy and experience in administration and teaching.

(2) *Italy:* The Institute for Nervous Diseases in Milan is establishing a clinic for treatment of cerebral palsy and an outpatient consultation center for children. The Institute desires a skilled American physical therapist to assist in training Italians in this work.

The closing date for filing applications is October 15, 1950. Requests for application forms and further information should be addressed to:

Committee on International Exchange of Persons
Conference Board of Associated Research Councils
2101 Constitution Avenue, Washington 25, D. C.

National Foundation Announces New Director

Dr. Herbert T. Wagner of Salt Lake City, Utah, has been appointed Director of Hospital Services for the National Foundation for Infantile Paralysis, it was announced today by Basil O'Connor, the organization's president.

Dr. Wagner succeeds Catherine M. Maloy who leaves a post that she has held for almost four years to return to the field of hospital administration. The appointment is effective immediately. The new Director of Hospital Services comes to the National Foundation from the Utah State Hospital for Poliomyelitis and Other Crippling Children's Diseases, where he served as director from January, 1949, to the time of his resignation last month.

Dr. Wagner will be responsible for organizing, planning, and directing hospital services of the National Foundation, working with hospital administrators, trustees, and medical staffs to develop facilities and staff for the best possible care and treatment of polio patients. The hospital service program was developed and expanded by Miss Maloy during her service with the National Foundation since 1946.

A native of Indianapolis, Dr. Wagner took his premedical work at Miami University, Oxford, Ohio, and later attended the Universities of Berlin and Vienna. He received his B.A. and M.D. degrees at the University of Indiana, and holds a master's degree in business administration from the University of Chicago. Before assuming the post of director at Utah State Hospital, Dr. Wagner was Program Director of Hospital Facilities of the U. S. Public Health Service for the intermountain region, with headquarters in Denver, Colorado. Prior to that he was a member of the medical staff of Culver Military Academy, Culver, Indiana; assistant director of Roosevelt Hospital, New York City; and director of the Meriden Hospital, Meriden, Connecticut.

Index to Current Literature

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Abstracts

Double-Zipper, Sponge Rubber Collar for Iron Lung (For Use in Emerson and Other Iron Lungs)

E. Bennette Henson, M.D., Charleston, W. Va. *In* THE WEST VIRGINIA MEDICAL JOURNAL, 46:6:148, June 1950.

For the past two years the Marmet Hospital, Marmet, West Virginia, has been using a double-zipper flap, sponge rubber collar designed by the writer to facilitate the placing of collar on to the neck of patient for the iron lung.

The heavy sponge rubber collar which comes as part of the equipment of the Emerson and other iron lungs is cut from the center toward the periphery a distance of about 4½ inches in the same manner as one would cut a large pie. In this instance the slice cut is approximately 8 inches wide at the periphery. A pocket-book type of zipper is then sewed to the two cut margins which allows this quarter segment to be lifted up allowing the head to be passed through the collar without any difficulty whatsoever.

This collar has been used in all of our iron lung cases during the past two years and has proved to be worthwhile.

A Progressive Resistance Exercise Apparatus for Physical Rehabilitation of Patients with Amputations, Fractures, and Paralyses of the Lower Extremity

Fritz Friedland, M.D., Marilyn M. Couture, Framingham, Mass. In ARCHIVES OF PHYSICAL MEDICINE, 31:6:401, June 1950.

A specially constructed apparatus is described which is used in connection with progressive resistance exercises for certain indications. Its advantages lie in (1) the protection of recent fractures of thigh and lower leg, (2) the means of applying progressively increasing weights to above-knee and below-knee amputation stumps, (3) the bracing of paralyzed knees for hip exercises, and (4) the elimination of weight from paralyzed or otherwise disabled ankle joints and feet during the application of progressive resistance exercise treatments to hip or knee. The device is simple and can be made inexpensively in any orthopedic brace shop.

Rehabilitation

Donald A Covalt, M.D., New York. In THE PENNSYLVANIA MEDICAL JOURNAL, 53:5:465, May 1950.

Many a disabled person has been prevented from achieving the fullest extent of his rehabilitation because all of the services necessary for his recovery were not available. Dr. Howard A. Rusk has established the basic philosophy that every facet of a patient's problem must be considered and adequately treated.

We have found that the basic plan of a well-rounded program utilizing the entire day has returned many patients to their jobs who were formerly considered hopeless.

The prosthetic service is an integral part of the services of the New York University Institute of Physical Medicine and Rehabilitation. It is strictly a consultant service. We do not manufacture limbs but rather examine the patient and recommend the proper type of limb for each individual patient. We prefer to see these patients as soon as possible after surgery. After examination, the necessary physical therapy is started immediately to prepare the stump for a prosthetic device.

I would like to mention briefly the patient who must be restricted in movement because of fractures of the long bones and the injury of ligaments and capsules that result from sprains. We have found that graduated exercises to the well parts of the body increase the circulation. Research work done on conscientious objectors during the war showed that even a man without an injury would experience a general body debilitation and weakness of muscles if kept on an inactive bed status.

I think that one of the most recent advances to come out of the war has been the utilization of preoperative and postoperative exercises in the tuberculous and nontuberculous thoracoplasty patient.

Finally, I should like to point out the necessity of treating, not the injury alone, but the whole man. If we are to enable a patient to attain the fullest peak of rehabilitation, capable of self-care, and return to economic usefulness, we must treat the man as well as the injury. Every facet of his problem, whether it be psychologic, physiologic, sociologic, or economic, must be given adequate attention, and we believe that such treatment must be under the direction of a physician.

Collateral Circulation, Natural and Artificial

Sir James Learmonth, K.C.V.O., C.B.E., F.R.C.S.Ed., Edinburgh, Scotland. In SURGERY, GYNECOLOGY AND OBSTETRICS, 90:4:385, April 1950.

In order to avoid, to diminish, or to correct ischemia the clinician must try to arrange: (1) that as much blood as possible reaches the arterioles, by keeping the arterial main and terminal branches dilated, and (2) that the arterioles are kept widely dilated, to increase the amount of blood reaching the capillaries.

When arterial obstruction is of slow evolution, enlargement of pre-existing collateral channels may keep pace with the gradual narrowing of the original channel, provided that the needs of the tissues are not increased by increased calls upon their physiological activity.

General measures include rest, which reduces the metabolic needs of the part, and the avoidance of local heating, which increases them.

The nonoperative methods for dilating arterial branches fall into two groups. First, peripheral vasodilatation may be produced reflexly by heating areas of the body other than the threatened part at a temperature of about 45 degrees C.; and second, it may be induced by the action of drugs. Both these methods have the disadvantage that widespread vasodilatation leads to a fall in peripheral resistance and so to a fall in aortic blood pressure, which is undesirable because it must be compensated for by increase in cardiac output and increase in pulse rate, if peripheral volume flow is to be maintained at a high level.

To secure the best results in treatment I believe that it is absolutely essential for the vasodilatation to be *continuous and prolonged; it is difficult if not impossible* to achieve this by the action of drugs. We have found that peripheral vasodilatation may be continuously maintained, with least inconvenience to the patient, by the use of electrically heated gloves.

Summary. The physics of the arterial circulation before and after obstruction of a main artery is described. The task of a collateral circulation is to carry blood to the capillaries in quantity and at a high pressure. This is best accomplished when the alternative routes return blood to the main arteries distal to a block.

General measures to encourage collateral circulation include rest, anticoagulant drugs, and avoidance of local heat to the ischemic part. The collateral circulation may be encouraged artificially by reflex vasodilatation, by drugs, or by operation. The advantages and disadvantages of each of these methods are discussed.

Diagnosis and Treatment of Infantile Paralysis

Edgar J. Huenekens, Minneapolis. In POSTGRADUATE MEDICINE, 7:2:100, February 1950.

This paper has not been planned to cover all aspects of the diagnosis and treatment of poliomyelitis but rather to select a few important practical points. To recapitulate briefly on the diagnosis: during an epidemic of infantile paralysis, physicians must be polio conscious and evaluate critically cases which at other seasons of the year can be dismissed as simple, upper-respiratory infections. Treatment of all cases in a hospital is advisable; even the mildest forms may suddenly develop bulbar symptoms and require emergency care.

The first step, after the patient is admitted, is to place him in a properly prepared bed. As soon as the calf muscles are loose enough to allow 90 degrees dorsiflexion, the patient's feet should be placed against the foot board to stimulate the standing reflexes.

Before discussing further steps of the treatment, a definition of terms is in order.

Spasm is the term used to describe the highly irritable and painful shortening of muscles, fascia, and subcutaneous tissues.

Incoordination is important in poliomyelitis. Patients frequently use wrong muscles or parts of muscles in attempting to carry out activity, or may substitute stronger muscles for weaker ones. Coordinate rhythmic function is emphasized in the treatment because coordination is actually more important than strength in the performance of daily activities.

Motor denervation is an irreversible paralysis due to anterior horn cell destruction and, of course, is not alleviated by the Kenny or any other method of treatment. The actual treatment has for its object the release of abnormal shortening, and the establishment of a pattern of movement which is normal or as near normal as possible.

Hot packs are applied for the release of the shortening and the relief of pain.

The application of hot fomenta is accompanied by a

skilled system of joint movements to re-educate nerve pathways. This phase of the treatment is divided into three distinct parts, each directed to a particular portion of the central nervous system. The first step is *tender stimulation* of nonfunctioning muscles. The muscles and joints are moved through a short range in an effort to establish a reflex movement. This is done four times daily.

The second step is an attempt to establish mental awareness by *passive movement*.

As soon as the patient seems aware of the part or when some motion is noted, active assistive movements are begun.

Brachial Neuralgia

W. M. Philip, M.B., M.R.C.P., Birmingham. In BRITISH MEDICAL JOURNAL, No. 4660, p. 986, April 29, 1950.

Brachial neuralgia is at present a less exact diagnosis than sciatica, and includes many diseases in which the presenting symptom is pain radiating down the arm; but there is a group of cases in which the symptoms are those of root irritation comparable to that found in sciatica, and in these a diagnosis of prolapsed intervertebral disk is commonly made. There are, however, reasons for believing that such a lesion is not the commonest cause of brachial neuralgia, and that, instead of a prolapse of the nucleus pulposus, arthritic changes in the neurocentral joint are the most usual source of root irritation in the neck. (Lund, 1943; Bull., 1948.)

Physical therapy is useful, and the injection of procaine into persistently tender areas in the muscles may give lasting relief, but the patient should be warned that when the immediate effect of the injection wears off there will be a temporary increase in the pain. Elliott and Kremer (1945) have shown that electromyographic changes are found in these tender spots, and that the changes disappear after a procaine injection. Elliott (1944) states that such relief does not exclude a root lesion.

Forty-two cases of brachial neuralgia are reviewed. The importance of the neurocentral joint is underlined and the significance of the radiological changes in the cervical spine, especially narrowing of the disk space, is indicated. The differential diagnosis is discussed.

Use of Positive Pressure as Aid in Handling Respiratory Paralysis from Anterior Poliomyelitis

R. L. Masland, R. B. Lawson, and W. M. Kelsey. In JOURNAL OF PEDIATRICS, 36:1, January 1950. Abstracted in JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:4:396, May 27, 1950.

Masland and co-workers used positive pressure breathing in ten patients with the respiratory or bulborespiratory forms of poliomyelitis during the 1948 epidemic in North Carolina. Severe pulmonary edema was reversed by the use of the positive pressure respirator in three patients, and pulmonary edema was probably prevented in some of the other patients. The progressive hypoventilation which develops in the paralyzed patient is due to pulmonary edema rather than to atelectasis in many instances. The intermittent use of positive pressure breathing leads to improvement in patients of this type. Positive pressure respiration has definite value in treatment of respiratory paralysis in poliomyelitis both in increasing the ease of movement of the patient and in the prevention and treatment of certain of the pulmonary complications which develop in the paralyzed patient.

Rheumatism: Comments on the Observations of Approximately 500 Cases of Rheumatic Diseases in a Private Practice

Charles F. Lowry, M.D., Council Bluffs. In JOURNAL OF THE IOWA STATE MEDICAL SOCIETY, 40:5:214, May 1950.

This paper is written with the purpose of presenting some of the practical problems to the general practitioner concerning the more neglected factors in the present day therapy of rheumatic diseases. The observations were taken from the study of approximately 500 cases, over a period of two years, in a specialized practice in a Midwestern community.

The more common types encountered in a general practice are discussed as to the incidence, diagnosis, prognosis, and treatment. Emphasis is placed on the more practical considerations and the apparent pitfalls in management. There is no specific treatment, and the measures most practical are stressed. The individual must be treated and not the joints per se. Special consideration is given to *rheumatoid arthritis*, the type affecting the younger individual in the prime of life, in which early, continuous, and intensive treatment is necessary to prevent serious crippling and economic loss. The individual with degenerative arthritis and fibrositis must be taught to live with his disease, and common sense measures must be instituted to provide the maximum in systematic relief since there is no definite cure.

The basic principles of the treatment of all rheumatic diseases—rest, physical therapy, and relief from pain and symptoms—are stressed.

Medical Rehabilitation of the Physically Handicapped

Murray B. Feederber, M.D., Pittsburgh. In THE PENNSYLVANIA MEDICAL JOURNAL, 53:5:475, May 1950.

The busy practitioner is concerned chiefly with the physical care of his patients, first with prevention and diagnosis, and second with definitive medical care. The first two phases of practice will run in certain stated lines, but a "third phase" is concerned with the restoration of the handicapped to the fullest physical, mental, social, vocational, and economic usefulness of which they are capable.

The *author* has attempted to demonstrate the following criteria for medical rehabilitation:

(1) All hemiplegics are not permanently disabled.

(2) Simplicity and economy of mechanical devices will assist in the rehabilitation of such cases.

(3) Common shoulder injuries are frequently and incorrectly diagnosed and the treatment of such disabilities follows definite lines.

(4) Early ambulation, a form of rehabilitation, prevents the deconditioning process. It is the obligation of the physician wherever possible to direct and lead his patient from the point of injury or illness to the final phase of physical restoration—his job.

Psychiatry in Geriatrics

Walter P. Gardner, M.D., F.A.C.P., St. Paul. In MINNESOTA MEDICINE, 33:4:355, April 1950.

Certain aspects of the role of psychiatry in geriatrics are reviewed. These include the scope of the problem of the aged, the factors involved in the production of certain of the less severe and of the more grave psychiatric problems of this age group, and the nature and management of these particular disorders.

Some Medical Aspects of Atomic Warfare

Major A. Lundie, M.C., Royal Army Medical Corps. In JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, 94:5:246, May 1950.

While recent newspaper articles have stressed various possibilities of atomic warfare, there is still a widely held belief that nearly all aspects of this subject are shrouded in secrecy. Some of the unclassified material which is now available is to be found in the references at the end of this article and it is hoped that this may be of some use to those who wish to study the subject further.

Atomic warfare of the future may involve the use of much more powerful weapons than have so far been demonstrated; but the information collected in Japan and obtained by experimental and clinical study will help to guide the preparations which must be made for such a disaster. The various effects which may be met in atomic warfare can all be studied in peacetime although on a somewhat reduced scale. Burns of all types are only too much with us and wounds of all types had been encountered for a long time before 1945. Many years separate the first radiation burns from those reported by Knowlton and others at Eniwetok. Acute effects of total body ionizing radiation are discussed by Tsuzuki in a paper which appeared some twenty years before his report on the Hiroshima cases.

The explosion of an atomic bomb can liberate an enormous amount of energy in an extremely short period of time. The final effect will depend on the efficiency of the weapon and the conditions under which it operates; but in all cases the injuries produced can be grouped under the following three headings: (1) mechanical injuries, (2) thermal injuries, and (3) radiation injuries.

Electrophysiological Studies of Nerve and Reflex Activity in Normal Man—I: Identification of Certain Reflexes in the Electromyogram and the Conduction Velocity of Peripheral Nerve Fibers

J. W. Magladery and D. B. McDougal, Jr., Baltimore. In BULLETIN OF THE JOHNS HOPKINS HOSPITAL, 86: 5:265, May 1950.

The studies reported in this and the succeeding two communications were undertaken in the course of investigating certain peripheral manifestations of spinal cord reflex activity in man. Some of the electrical patterns evoked by mixed nerve stimulation have been previously described—others to be presented in this paper are new. It became apparent that alteration of such peripheral sensory and motor mechanisms by ischemic block introduced a useful modification in the analysis of these patterns. A review of the literature pertinent to the effects in man of such blocks revealed several divergent observations and interpretations. These were especially confusing in regard to the details and mechanisms of the postischemic state. The phenomena have, therefore, been reinvestigated from a descriptive standpoint. Likewise, the concomitant alterations in certain objective electrical patterns evoked by peripheral nerve stimulation have been studied under these conditions. Wherever possible, information gained in this manner will be used in interpretation of mechanisms underlying the clinical findings. This first paper describes some of the patterns normally evoked by stimulation of a mixed peripheral nerve in man. Preliminary deductions will be made regarding their interpretation. The analysis will be extended in subsequent papers wherein the effects of ischemia and the postischemic state will be described and discussed.

Summary: Some patterns of electrical activity evoked by stimulation of mixed peripheral nerves in the limbs of man have been described. Experimental results have been presented which indicate that impulses in both motor and afferent peripheral nerve fibers show a distal slowing.

A component in the electromyogram recorded from certain skeletal muscles has been identified and shown to be of reflex origin. The afferent pathway of this reflex is composed of fibers which conduct more slowly than those of the well-known stretch reflex (Hoffmann, 1922) found in calf muscles.

Certain implications of these observations in the study of peripheral nerve and reflex mechanisms in man have been discussed.

Electrophysiological Studies of Nerve and Reflex Activity in Normal Man—III: The Postischemic State

J. W. Magladery, D. B. McDougal, Jr., and J. Stoll, Baltimore. In BULLETIN OF THE JOHNS HOPKINS HOSPITAL, 86:5:313, May 1950.

The release of an otherwise normal limb from circulatory arrest is followed by a variety of sensory and motor changes. Reid (1951) described such paraesthesiae and correlated them temporally with motor responses in distal muscle groups. He reported the latter in detail as "fibrillary twitchings" and stated "especially during its later part, the contractions become markedly prolonged." His deductions that these phenomena arose from a hypocalcemic hyperexcitability of peripheral sensory endings and muscle fibers lack adequate support. Nonetheless, his observations merit careful attention.

Almost concurrently, Lewis, Pickering, and Rothschild studied the symptoms and signs accompanying prolonged ischemia and its release.

Weddell and Sinclair repeated many of the earlier experiments dealing with the clinical aspects accompanying ischemia and following its release.

More recently, Merrington and Nathan have reported the results of numerous experiments on themselves and on patients with different lesions of peripheral nerves and central nervous system. The studies were confined to postischemic paraesthesiae.

These conflicting descriptions and conclusions from the most recent observers indicate the desirability of further study. This has been attempted in the present investigation wherein objective recording methods were applied to certain characteristic features which follow release from ischemia. The findings will be interpreted, wherever possible, in the light of alterations found to be produced during the postischemic state in evoked action potentials of muscle and nerve.

Summary: It has been shown that there are sensory and motor components to the phenomena occurring after restoration of circulation to a previously ischemic limb. The latter are reflexly induced by the former. The site of initiation of the paraesthesiae has not been identified, but there is good evidence that they arise distally, and most probably at sensory endings.

Depression of afferent fibers distal to occluding cuffs has previously been shown to be a general one, but more rapid in onset and more profound in the case of fibers, or those parts of fibers, of highest velocity. Restoration of circulation is followed by recovery in the same order. Paraesthesiae make their first appearance at a time when the most rapidly conducting fibers of the nerve recover. This suggests that impulses contributing to the appre-

citation of paraesthesiae probably traverse fibers of high conduction velocity, and implies that pain pathways are not likely involved.

Possible mechanisms of the initiation of paraesthesiae locally have been considered. It has been concluded that the results presented in this communication are compatible with an explanation that the phenomena are due to a restitution of normal equilibrium—presumably ionic—which had been disturbed by ischemia. Results of other workers have suggested that the shifts entailed might be those of potassium.

Electrophysiological Studies of Nerve and Reflex Activity in Normal Man—II: The Effects of Peripheral Ischemia

J. W. Magladery, D. B. McDougal, Jr., and J. Stoll, Baltimore. In BULLETIN OF THE JOHNS HOPKINS HOSPITAL, 86:5:291, May 1950.

It has long been known that sensory alterations, paraesthesiae, and certain motor changes accompany and follow ischemia and direct nerve pressure in otherwise normal man. These were clinically described by Goldscheider and other early authors. It is only in the past twenty years, however, that increased knowledge of nerve fiber activity and improved investigative methods have prompted more detailed studies. In 1931, Lewis, Pickering, and Rothschild investigated the symptoms and signs accompanying ischemia and its release. In essence, the progress of sensory impairment was reported to be a centripetal one. It was verified that ability to appreciate pain, heat, and cold was retained long after other sensory modalities were no longer felt. Various experimental modifications led the authors to believe that the observed phenomena were due to ischemic changes in the segments of nerve actually compressed by the occluding cuff. These changes were thought to appear first and be most profound in the longest and largest fibers.

Summary: Ischemia, produced by limb occlusion with a sphygmomanometer cuff, has a depressant effect on conduction in Group A motor and afferent fibers in peripheral nerve trunks in man. This effect is a generalized one throughout the fibers, and not the result of local pressure on the segment directly underlying the occluding cuff.

In representative groups of both afferent and motor fibers, depression occurs earlier, and is more profound in proximal than in distal parts of the same nerve fibers. This finding, taken in conjunction with comparative conduction velocities, suggests that a gradient exists for these characteristics throughout the nerve trunks.

In all three instances where afferent fibers were studied, sensitivity to the effects of ischemia increased with increasing conduction velocity. Motor fibers, however, were somewhat more resistant than certain afferent fibers of slower conduction rate.

Muscle Fibrodystrophy in Children

Robert Bingham, M.D., Riverside, Calif. In WESTERN JOURNAL OF SURGERY, OBSTETRICS AND GYNECOLOGY, 58:6:288, June 1950.

This report is to call attention to a mild but more prevalent neuromuscular disorder which has not been previously described as occurring in children.

Muscle fibrodystrophy is defined as a chronic nonprogressive muscle dystrophy characterized by weakness and contractures of the skeletal muscles. It is found in childhood and adult life and is the cause of a type of chronic physical disability.

The typical patient is a slender child with poor posture, contracted back, and hamstring muscles, who complains of being weak and easily fatigued. The majority of the patients with this condition were referred for orthopedic examination because of *poor posture*. This was usually the symptom first noted by the parents, or school and public health nurses in periodic health examinations. Other symptoms reported by the children or noted by their parents were excessive tiredness after exercise, muscle soreness, cramping in the muscles of the back or lower extremities after physical exertion, awkwardness in gait, clumsiness in movement, and poor coordination in recreation and athletic sports. Some patients complained of "growing pains" in their muscles at night.

Conclusions: Muscle fibrodystrophy has been demonstrated to be present in a large number of otherwise healthy children. The incidence varies from four to ten percent of our child population.

Muscle fibrodystrophy is a clinical syndrome characterized by shortness and contraction of body musculature, particularly in the dorsal spine and hamstring groups, although any and all muscle groups may be affected.

Muscle fibrodystrophy in children causes chronic physical disability, weakness, fatigue, loss of coordination, and decreased endurance.

Muscle fibrodystrophy is one of the chief causes of poor posture in children, particularly lordosis and dorsal round-back deformities.

The most probable cause of muscle fibrodystrophy is mild and unrecognized, or untreated, acute poliomyelitis.

Muscle contractures caused by muscle fibrodystrophy do not disappear spontaneously and require treatment from three months to two years. The treatment consists of proper exercises, the application of moist heat, muscle stretching, exercises to build muscle strength, and, finally, exercises for muscle coordination.

From the study of fifty-nine cases of muscle contractures in children, over a three-year period, it is concluded that muscle contractures are not "normal" for children, but comprise a definite clinical entity conveniently called muscle fibrodystrophy, which, if not treated, will produce a partial disability for life.

The recognition and treatment of these cases of muscle fibrodystrophy is a responsibility of the medical profession, particularly in the field of preventive orthopedics and pediatrics.

Uses and Abuses of the Respirator in Poliomyelitis

Jack R. Hild, M.D., Houston. In TEXAS STATE JOURNAL OF MEDICINE, 46:6:365, June 1950.

If only one respirator is to be maintained in a small community or hospital for emergency use, the tank-type would be the one of choice. Smaller units, called portable respirators, are operated by self-contained batteries or by light circuit, and are easily transported by automobile or by ambulance. These portable units either encase the upper part of the body up to the neck or have plastic shells that fit over the anterior part of the chest and upper abdomen. They are used in emergencies, for transportation of respirator patients, for weaning patients from the tank-type respirator, and in some instances to replace the larger respirator.

The rocker bed, which mechanically raises and lowers the head at a controlled speed is finding wider application as experience is gained in its use. It may be used to help wean patients from the tank respirator and in many instances its employment has been sufficient to ventilate the patient and avoid the conventional respira-

tor. It has the great advantage of working without the application of artificial pressures, the patient may receive physical therapy while respiration is being mechanically maintained, and the motion of the bed greatly enhances peripheral circulation. The present feeling is that severely involved patients will still have to be treated in the conventional tank-type respirator.

Proper selection of patients actually encompasses the indication for use of the respirator. I believe that too much emphasis has been placed on outliners of indications for use, and because of the existence or nonexistence of stated factors the respirator was or was not used. It may safely be said that it is indicated in all cases in which the skeletal muscles, as a result of spinal involvement, become unable to carry on the function of respiration. The presence of associated bulbar involvement is not a contraindication to treatment in the respirator; it is a grave complication.

The act of placing a patient in a respirator should be accomplished as quietly and efficiently as possible.

All nurses caring for respirator patients should know how to operate the respirator manually in the event of mechanical or power failure, and the machine should be inspected to make certain that the handle is in its proper place and that it can be attached if needed.

It is not always easy to evaluate the status of the patient and to determine when he is ready to be removed from the respirator. Those who have had marked involvement develop a fear of being taken out. Older children and adults are harder to wean than small children. The process of weaning should start when the respirator is started.

If the patient becomes entirely dependent on the respirator, the nurses must perform their duties quickly and efficiently. The advice and consultation of the orthopedist and physical therapist should be sought during the acute stage and a regular routine of physical therapy should be outlined and followed. The rocker bed or one of the portable types of respirator may be of material aid in carrying out such a program. Rehabilitation should be started early and continued. Simple forms of occupational therapy should be started early. The welfare of the patient as a whole must not be submerged by the fact that he is in a respirator.

Indications for the use of a respirator in caring for the patient with poliomyelitis are based clinically on signs and symptoms which result from varying degrees of anoxia and altered excretion of carbon dioxide. Poor results have come from ill-timed or improper use of the mechanical respirator and frequently could be avoided by careful observation of the patient in the early stages of the disease. Complications resulting from respiratory involvement and from respirator life are frequent and are often fatal; their early recognition and treatment are essential for good results. Patients with severe involvement of the muscles of respiration are best treated in the tank-type respirator. The rocker bed and the portable types of respirators may be of value in caring for less severely involved patients and as aids in weaning from the larger respirator. Good psychologic handling together with early and continued efforts at rehabilitation are needed to help these patients return to a more useful life.

Sheltered Workshops

George G. Deaver, M.D., New York. In THE CRIPPLED CHILD, 28:1:7, June 1950.

Rehabilitation of more than twenty-three million disabled persons is one of the major problems which our nation must solve. Congenital defects, accidents, and disease have been the chief causes of physical disabilities; but our aging population is now contributing the largest percentage of disabled persons.

As many of these individuals as possible must be restored to their maximum physical, emotional, social, and educational capabilities so that they may become independent of the help of others, or at least be placed in a vocation best suited to their abilities and disabilities. The essential factor to consider for most handicapped persons is their physical capabilities.

In considering job placement for the disabled the following factors must be considered: Has maximum physical rehabilitation been attained? Can this person travel to a job by the usual means of transportation and care for his daily needs while at work? Would it be possible to train him to perform these activities essential for daily living and working?

The vocational guidance counselor must classify the disabled person as to his ability to walk and travel, care for his daily needs, use his hands, and his ability to speak. With the aid of these facts, vocational possibilities can be prognosticated.

The sheltered workshop is one aspect of our work program which must receive greater emphasis. It is the place for work reconditioning and the proving ground where a final evaluation of the person's work potentiality can be made. Here therapy can be provided in a work program while the handicapped person is paid for receiving treatment. In planning a sheltered workshop, however, it is essential first of all to decide the purpose of the program, as there are many types of workshops.

There are two improper ways of conducting a sheltered workshop—ways which indicate less concern with the handicapped than with impressive production records. One of these is to select only those patients who have enough physical ability to turn out large volumes of work, enabling the workshop to fulfill contracts efficiently. The other improper approach is to retain handicapped persons who have acquired enough skill to go out into industry, but are kept in the workshop to bolster production records. The more efficient the workers become, the greater the desire is to keep them.

The ideal sheltered workshop for those handicapped by congenital defects, disease, or trauma, who are in need of physical rehabilitation to meet the demands of daily living and working and the opportunity to gain skill and speed in productive employment best suited to their abilities and disabilities, requires the following equipment and personnel:

(1) Sufficient space for a sheltered workshop and rehabilitation units which have facilities and personnel to teach the disabled person how to work and meet his physical deficiencies in walking, climbing, self-care, better use of the hands, and speech

(2) A consultant physician to evaluate each person's disabilities and formulate his program

(3) Qualified physical and occupational therapists and speech pathologists who have the training and facilities to carry out the physical program

(4) A director who has mechanical skill and imagination

There are certain factors which may cause failure to meet the needs of the disabled in a sheltered workshop program:

(1) Do not spend money on the purchase of an elaborate building or equipment, or accept them as gifts. The success of the program depends upon trained and interested personnel and not on physical equipment.

(2) Do not measure success of the sheltered workshop by the number of disabled persons in the shop or the amount of work produced. Success should be measured by the number of people discharged from your shop to gainful employment in industry or who have been helped in meeting the physical demands of daily living and working.

(3) Do not accept work in the shop which is beyond the capabilities of your workers or which must be completed at a given time.

(4) Do not pamper disabled workers if you expect them to become productive workmen.

(5) Do not go outside of your community for the director of the workshop. Select a man who has worked in a mechanical capacity in a local industry who is interested in your project and disabled people. He will know the community resources for obtaining the type of work suited for the workshop and the possibilities for placing disabled workmen in industry. When you have selected your director, send him around the country to visit other sheltered workshops. The knowledge gained by visiting other workshops will pay large dividends.

Success depends upon outlining purposes, policies, and objectives and having the industrial leaders of your community help you work out your plan.

Venous and Lymphatic Stasis in Lower Extremities: I. Test for Incompetence in Perforating Veins, II. Simple Method of Adequate Control

W. J. M. Scott and M. Radakovich. In SURGERY, 26:889, December 1949. Abstracted in JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 142:17:1591, April 29, 1950.

Most of the physical measures previously in common use had the defect of not overcoming the venous stasis in the lower part of the legs. They use an antipulse legging, which consists of an outer duck casing containing a butterfly-shaped balloon in an inner pocket. The balloon is inflated and the pressure changes with walking. In effect a deep fascia has been placed outside of the skin, and the subcutaneous veins and lymphatic spaces are compressed rhythmically on walking. This pulsating pressure, powered by the muscular contractions in the leg and exerted throughout the lower part of the leg, is important in driving out the excess of extracellular fluid. Lymphedema and venous stasis were effectively controlled, induration of the subcutaneous tissues was reduced, ulcers were healed, and recurrent attacks of cellulitis and phlebitis were curbed.

Colles' Fracture: A Study of End Results

William H. Cassebaum, M.D., New York. In THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143: 11:963, July 15, 1950.

All 361 patients in this series were treated in a similar manner. The sole important variable was the amount of wrist flexion in which immobilization was carried out after manual reduction. Only plaster splint fixation was used. The dorsal splint was carried distal to the knuckles and the volar one to the proximal palmar crease. This permitted full finger motion, for which the patient was urged to strive. Elevation of the part was prescribed for as long as necessary to get rid of edema. Shoulder motion was advised for those who carried the arm in a sling. When the splints were removed, active motion and exercises of the wrist were begun. These have a twofold purpose, namely, to increase motion and to redevelop the forearm muscles. Physical therapy was not used unless it was requested, and then its relative inferiority to active exercise was impressed on the patient. It was used for the occasional demoralized person who needed the feeling that something was being done for him and that others were interested. Through a more frequent contact with the patient was maintained. The daily application of moist heat proved helpful, and patients reported increased ranges of motion during this treatment.

Since this study, we use splints much more frequently to immobilize the elbow. Permitting elbow motion is a frequent cause of motion at the fracture site, with consequent loss of position. In our experience, immobilization in marked palmar flexion results in a painful, prolonged convalescence.

If union is sufficiently solid and finger function is normal at the time the splints are removed, the recovery of wrist motion is swift and not a great problem. Under these conditions, 30 to 60 percent of normal motion is present when the splints are discarded. Further recovery in the following month results in 60 to 100 percent normal motion.

The problem is different when finger motion is poor and the splints are removed too early, *i.e.*, before the callus is sufficiently strong. Then pain occurs on attempted motion of the wrist, and spasm, swelling, and increasing stiffness of the fingers develop. Even though one waits until the callus is sufficiently strong to remove the splints, if finger motion has been poor and the patient unable to make a tight fist, recovery of wrist motion is slow and requires a matter of months. The decreased circulation consequent to lack of function results in persistent edema and a shortening and thickening of ligaments.

Another factor in the recovery of joint function is muscle strength. When muscles operating over joints atrophy, the greatest and most important force in recovering joint function is greatly weakened. Atrophied muscles of the forearm cannot stretch tightened ligaments. Atrophy of the flexors of the forearm is always apparent if the patient has not used the hand during the period of splinting. Exercises to increase muscle strength are as important in the recovery of joint function as are exercises which move the joint. For these reasons, the speed of recovery of joint mobility tends to accelerate, increasing as joint movement and muscular strength increase.

Unfortunately, many principles of the treatment of Colles' fractures are insufficiently known or their applications are not enforced. Consequently one constantly sees patients who originally sought care for a disabled wrist and later seek care for a disabled hand. We feel that the following are common violations of the principles: (1) rocking the fracture back and forth to break up the impaction, an action which further comminutes the fracture and injures the soft tissues, (2) application of splints without anticipation of further reactive swelling and edema, (3) neglect of shoulder and finger exercises, (4) inadequate immobilization due to (a) poor splints or (b) too brief a period of immobilization (*i.e.*, under five to six weeks in patients with deformity), (5) immobilization in marked flexion, which position is painful and interferes with circulation, and (6) failure to make the patient understand the importance of early function of the fingers and the dominant role of active exercises in the recovery of function.

The late complications in cases of Colles' fracture concern joints, tendons, or nerves. Increased arthritic changes in the hand are unfortunate sequelae in a few patients already suffering from this condition. Subluxation of the lower radioulnar joint, with pain and clicking, occurred

in one case. Stiffness of the shoulder is another complication. It occurs when a patient carries his arm in a sling continuously and fails to exercise the shoulder during immobilization of the wrist.

The functional end results were good or excellent in 127 of 135 cases of Colles' fracture. In only eight were there poor functional results. Good or excellent function included absence of pain, good strength, and an adequate range of motion. While there appeared to be a parallel relation between anatomic and functional end results, good function usually resulted even when the anatomic result was poor. This was especially true when the fracture occurred during the first four decades of life. A good early functional result was much more dependent on good treatment than was the final result.

The complications associated with Colles' fracture have been described. They involve joint function, muscles or tendons. A painful disabled hand was the most common complication of Colles' fracture in our group of cases. When this occurred, the recovery of good function required months.

Poliomyelitis in Pregnancy

Max J. Fox, M.D., and Frank H. Belfus, M.D., Milwaukee. In AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, 59:5:1154, May 1950.

The occurrence of poliomyelitis in association with pregnancy has been a subject of special interest to us over the past several years. It has been our clinical impression that in recent years we have seen these cases in a number which would suggest more than a chance distribution of the disease in pregnant women.

Of the thirty-three cases of poliomyelitis in pregnancy herein presented, the incidence of abortion was 21.2 percent, which, while not unusually high for a group of pregnant women, was nevertheless closely associated with the episodes of acute illness. Four patients died, making the mortality rate 12.1 percent for the group. Labor and delivery were complicated as a result of poliomyelitis in only two patients and these were delivered successfully by cesarean section.

A follow-up study of this group of women revealed that twenty-two normal babies of average birth weight were born. There were two infant deaths: one stillbirth resulting from cord hemorrhage, and the other from erythroblastosis. There is no evidence to indicate that poliomyelitis in the mother left any stigma on the surviving infants.

Electromyographic Patterns in Reinnervated Muscle

Melvin D. Yahr, M.D., Ernst Herz, M.D., Joseph Muldaver, M.D., and Harry Grundfest, Ph.D., New York. In ARCHIVES OF NEUROLOGY AND PSYCHIATRY, 63:5:728, May 1950.

Extensive reports are available concerning the action potentials occurring in normal and denervated muscles. A few investigators have reported the electromyographic changes during the process of reinnervation following section and suture of peripheral nerves. However, these reports have been confined to a relatively short period following the suture.

A study of the action potentials in seventy-six cases of reinnervated muscles three to five years after suture of the peripheral nerve is presented.

Two outstanding electromyographic patterns were recorded in these muscles: (a) a combination of spontaneous action potentials and small motor unit discharges on effort, and (b) large spike potentials, ranging in amplitude from 5 to 15 millivolts, occurring with volitional contraction and having the characteristics of motor unit discharges.

A correlation of the electromyographic changes and the anatomic characteristics of reinnervated muscle is suggested, namely, that the motor units responsible for the large potentials contain a larger than normal number of muscle fibers.

Active Splinting of Radial-Nerve Palsy

K. W. N. Palmer, T.D., L.M.S.S.A., D. Phys. Med., Director of Physical Medicine, Durham and Gateshead Hospital Groups. In THE LANCET, No. 6611, p. 906, May 13, 1950.

The loss of normal muscle tone and active movement in the extensors of the wrist and fingers as a result of peripheral nerve injury is a severe handicap. The object of the splint described here is to restore conditions to as near normal as possible during the period of regeneration after such an injury.

As a principle, the aim should be to produce normal or as near normal action as possible in a paralyzed limb. The tendency to adapt a machine to fit a patient's disability usually produces abnormal and clumsy movement. Active splinting "feels right" and enables the patient to reproduce something very like the existing coordinated movements without a great effort of concentration.

Fatalities Following Curare

Richard Foregger, M.D., Milwaukee. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 142:17:1344, April 29, 1950.

Three fatalities considered to be due to a dangerous side action of curare are reported. The literature is partially reviewed and found to contain references to nineteen fatalities following the use of curare. Several near fatalities are reported. They are likewise considered due to the side action of the drug.

The incidence of fatal reactions with curare is low; its value in medical practice assures continued usage. The observations of this brief survey suggest that further study should be made so that suitable means may be found to counteract undesirable toxic reactions when they occur. At the present time, available knowledge suggests that the antihistaminic drugs and procaine may be helpful in treating the respiratory complications of curare.

Psychosomatic Disorders of the Muscles, Bones, and Joints

Werner P. Jensen, M.D., Omaha. In THE NEBRASKA STATE MEDICAL JOURNAL, 35:6:179, June 1950.

Pains and aches of the musculoskeletal system are frequently of psychogenic origin. Perhaps the main attraction of orthopedic surgery to the medical student and interne is the false impression that in this field there will always be an X-ray film showing a fracture or some positive evidence of organic disease, or that there will be a deformity or visible or palpable cause for the complaints.

These individuals can be helped occasionally by adjusting their lives. The occupation, environment, and responsibilities may be beyond the patient's mental capacity and the adjusting of this situation may relieve all of his symptoms. Rest, sedation, physical therapy, and medication also are required in the treatment of a psychosomatic pain.

The Effect of Paralysis of One Lower Extremity on Bone Growth: Preliminary Report

Glenn Gulliksen, Jr., M.D., M. Olsen, B.S., and F. J. Kottke, M.D., Minneapolis. In ARCHIVES OF PHYSICAL MEDICINE, 31:6:392, June 1950.

Eighty-eight cases of chronic poliomyelitis, with unilateral involvement of a lower extremity, in patients six months to fourteen years of age at onset, were examined three to seven years later. The relation between muscle strength, atrophy, and discrepancies in growth of the involved femur, tibia, and total lower extremity were analyzed. No correlation was found between muscle strength of the leg and shortening of the tibia. Significant, but very poor, correlation was found between the muscle strength of the thigh and shortening of the femur. There was a definite correlation between atrophy of the thigh or leg and shortening of the femur or tibia, between total strength of the involved extremity and shortening in that extremity, and between total atrophy and shortening of the involved extremity. The age at which acute poliomyelitis occurred appeared to bear no relation to the amount of shortening up to the time of bone maturity. The factors which may be related to soft tissue atrophy and diminution of bone growth have been considered.

Total Rehabilitation and Organized Medicine

H. Hoyle Campbell, M.D., Toronto. In THE CANADIAN MEDICAL ASSOCIATION JOURNAL, 62:6:600, June 1950.

During the past ten years there has been a definite swing of world philosophy toward social security for all. This has increased the demand for social services, and medicine, as one of these, is bound to feel this demand acutely in its fields of activity.

There are those among us who looked upon the efforts of physical therapists and occupational therapists as unnecessary and their work as nonsense. There was some justification in this attitude, since our best motivated patients got well from their disability or learned to live with it without such aid. But is this true of all our cases?

Society must consider all people, not just the best people. The government at its various levels, and charity, have done what they could.

It has become evident that the government has been doing more and more for the care of the crippled incurable, so why not let it care for all?

The great field of rehabilitation has sprung into prominence, fostered by the government and by commissions, such as the Workmen's Compensation Boards. Why? Something had to be done to retrain, re-educate, and re-establish the tremendous number of people injured and disabled in industry and the armed services. It saved money; it earned money by making taxpayers out of those consuming a large portion of the total tax income of the community.

What is total rehabilitation? It is defined as the process of assisting the disabled to attain the optimal physical, mental, social, economic, and vocational adjustment and usefulness of which he is capable.

We must educate our students and internes to realize that their responsibilities do not cease with the discharge of a patient from their office or hospital, and that rehabilitation begins with them and their diagnosis.

It has been shown that properly prepared and placed disabled can become efficient workers. Through the positive approach to rehabilitation, it is inexpensive to the community in the long run, as it pays for itself indirectly.

Respiratory Disturbances Treated by Breathing Exercises

Hanan Israel Weiner, M.D., Tel Aviv. In THE BRITISH JOURNAL OF PHYSICAL MEDICINE, 13:6:127, June 1950.

Since ancient times gymnastic procedures, intended to train the respiratory mechanism, have been used for prophylactic and therapeutic purposes. The Chinese book, *Kong Fu*, written about 4,500 years ago, reports on a special system of breathing exercises. Greek and Roman physicians (for example, Hippocrates, Celsus, and Galen) made use of remedial gymnastics and breathing exercises. Their lessons were followed by Oribasius in the later Roman period and Mercurialis in the Middle Ages.

In modern times, too, breathing exercises form a well-established procedure, but, in spite of extensive literature on the subject, few details of controlled investigations on the value of, and indications for, this method of treatment have been published. Moreover, a careful search of the literature fails to reveal a concise review of knowledge on the entire subject of the clinical application of respiratory therapy, the merits of which are still insufficiently recognized.

A complete consideration is presented of those respiratory and other disturbances which are benefited by the adequate use of breathing exercises.

Most beneficial effects are achieved in bronchial asthma and pulmonary emphysema, in pleuritic adhesions, in meteoristic abdomen, and after thoracic surgery.

Utilization of breathing exercises is of decided value in the medical management of compensated valvular heart disease, arterial hypertension, angina pectoris, convalescence after myocardial infarction, *cor gravis* and the effort syndrome, in sighting dyspnea with reduced physical efficiency, in kyphosis, scoliosis, flat back, ankylosing spondylitis, and pigeon chest. Each condition requires particular forms and varying degrees of breathing exercises. The method, if properly indicated and executed, is not dangerous.

Febrile Convulsions in Children

M. G. Peterman, M.D., Milwaukee. In THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:8:728, June 24, 1950.

A febrile convulsion may be distinguished from the other convulsions associated with acute infection by the arbitrary definition of a major seizure, associated with a rapid rise in temperature to a certain level, specific for each child, with a convulsive disorder. The fever usually precedes and precipitates the seizure.

Every convulsion in childhood demands a thorough study, including an electroencephalogram and an attempt to make a diagnosis. This is necessary as a guide for treatment, particularly today, with the new drugs available.

The high percentage of family histories of convulsions, electroencephalograms showing abnormalities, and subsequent development of epilepsy indicates that the convulsive disorder is inherited.

The immediate treatment in the febrile convulsion must be the reduction of the fever. However, the next problem, of equal importance and urgency, is the establishment of the diagnosis, as the basis for further treatment and prevention of recurrence. The treatment must be continued for at least one year after the last convulsion and after the electroencephalogram becomes normal.

Orally Given Mephenesin in Infantile Cerebral Palsy

Charles H. Frantz, M.D., Grand Rapids. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:5:424, June 3, 1950.

The treatment of cerebral palsy at the present time centers about muscle relaxation and re-education. The modalities employed in training a child are well defined and are executed in specific phases during the progress of a patient. The training period is long and tedious and may well be compared in length to the educational program of a normal child in his primary school. Surgical procedures, external bracing, and medication are considered adjuncts only.

The general opinion of the staff was that there was more consistent improvement in the subjects with tension athetosis. Children over ten years of age seemed to respond better than the younger subjects. In the over-ten age group, hand skills, which one would expect to be well developed in the normal child, seemed to improve the mephenesin therapy. Paradoxically, however, balance and gait did not seem to parallel the upper extremity gain. It was the opinion of the speech instructor and physical and occupational therapists that the drug certainly deserves a trial in the athetoid group.

Summary—Orally given mephenesin (tolserol) was well tolerated over a seven-month period in twenty-three children (86 percent) of a test group of twenty-seven subjects with infantile cerebral palsy.

No undesirable results were manifest in blood and urine studies.

Vertigo, nausea, vomiting, irritability, and listlessness were undesirable side effects noted in children receiving doses up to 2 Gm. Vertigo was in most cases easily controlled by change in dosage.

Children with spasticity and rigidity did not respond satisfactorily in the group evaluated. (They constituted 38.2 percent of children tolerating the drug.)

Of sixteen athetoid children, fourteen demonstrated beneficial effects (87 percent). (They constituted 60.8 percent of the twenty-three children tolerating the drug.) Children with tension athetosis seem to have a favorable response to mephenesin more consistently than other groups.

Partial Alopecia Due to Scalp Massage

R. E. Bowers, B.Sc., M.D., M.R.C.P., London. In THE BRITISH JOURNAL OF DERMATOLOGY AND SYPHILIS, 62:6:262, June 1950.

Observation of normal infants shows that the constant friction of the head on the pillow can produce a patch of short hair on the occiput, even though the rest of the hair is growing quite strongly; the patch regrows in a normal way soon after the infant begins to sit up.

In view of the frequency with which the public is urged to massage the scalp with one or another application, it seemed strange to me that a similar appearance was not recognized in adults, and the following cases are detailed here in the belief that they represent this condition.

Six cases of partial baldness are recorded in patients who were accustomed to vigorous massage of the scalp. All recovered after discontinuing the practice.

The appearances were remarkably similar in all cases, though modified by the presence or absence of some primary disease of the scalp or hair. It is suggested that massage is a cause of some cases reported as trichorrhexis nodosa and fragilitas crinium.

Subfascial Fat Abnormalities and Low Back Pain

R. J. Dittrich, M.D., Duluth. In MINNESOTA MEDICINE, 33:6:595, June 1950.

In recent years several investigators have called attention to the importance of fat tissue in the subfascial spaces as factors in painful syndromes. Our former concept of fibrositis as a clinical or pathological entity involving muscle or fibrous tissue has been dispelled by the discovery that the painful lesions which were interpreted as "fibrositic" nodules are, in reality, masses of fat tissue which have undergone changes and are causing varying degrees of disability.

From the review of the literature and observations on ten patients, it is evident that abnormalities of subfascial fat tissue constitute an important factor in the development of painful disabilities of the back. The principal features responsible for clinical manifestations are edema and herniation of the fat tissue. A knowledge of the principles and the mechanism of referred pain is essential for adequate evaluation of the clinical phenomena.

Priscoline for Pain in Poliomyelitis

William A. Reilly, M.D., and Ardwin H. Barsanti, M.D., Little Rock, Ark. In THE JOURNAL OF PEDIATRICS, 36:6:711, June 1950.

Thirty-five cases of poliomyelitis and one case of tetanus were treated with priscoline in an effort to reduce pain and spasm.

Less than one-fourth were definitely benefited; almost one-half were not benefited at all. The remainder were either doubtful or could not be completely evaluated.

This is a worthwhile drug when it acts favorably; in our hands it is about as effective as other drugs and safer than some, especially curare.

Fluctuating blood pressure was observed in all cases where there was bulbar involvement. This was probably due to the disease itself, although hypertension was noted in four cases where there was apparently only spinal disease.

It was felt by all observers that hot packs proved superior in the relief of pain and spasm, in the majority of patients.

From the experimental and clinical evidence, it would appear that a sympathetic antagonist would be the drug of choice in the control of pain and spasm, particularly if it could be given orally. Therefore, further study of such drugs is indicated.

Aureomycin in the Treatment of Poliomyelitis

Emanuel Appelbaum, M.D., and Raymond Saigh, M.D., New York. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:6:538, June 10, 1950.

Thirty-eight patients with nonparalytic poliomyelitis were treated with aureomycin during the early phase of the disease, while sixty-six patients did not receive the drug, and served as controls. The aureomycin-treated patients and the controls were admitted during the same period and were similar in all essential respects. The method of treatment and dosage have been described. The clinical results were about the same in the treated and the control patients. The development of paralysis in two of the treated patients but in none of the controls was regarded as fortuitous. In this study the use of aureomycin early in the disease did not appear to affect favorably the clinical course of poliomyelitis.

Care of Upper Extremity Paralysis in Poliomyelitis

Kristian G. Hansson, M.D., New York. In ARCHIVES OF PHYSICAL MEDICINE, 31:6:387, June 1950.

The residual symptoms of poliomyelitis are (1) spasm, (2) paralysis, and (3) deformity. Spasm is most prevalent in the acute stage, may or may not be found in the subacute stage, and should be absent in the chronic stage. Anything in therapeutics, be it physical or pharmaceutic, that will relieve spasm may be used. One must be sure, however, that all muscles are stretched to their normal length. Paralysis sets in during the acute stage, is most prominent in the subacute stage, and is found in the chronic stage in about 50 percent of the patients. The treatment should include proper support of paralyzed muscles in the physiologic rest position to prevent overstretching of muscles. Muscle re-education exercises are the principal activities for recovering of function of muscles, but electrical stimulation and weight-lifting also should be included. If muscle spasm has been released and weak muscles supported, theoretically speaking, there should be no deformity. When encountered, however, one should not hesitate to recommend braces and supports or orthopedic surgery.

Conclusions: Paralysis of upper extremities is more disabling than similar paralysis of lower extremities. Therefore, it becomes more important to observe all preventive and therapeutic measures.

The principal therapy, the after-effects of poliomyelitis anywhere, is to release spasm, support and strengthen weakened muscles, and prevent deformity.

It is especially necessary to use the proper brace in case of paralysis of serratus magnus and deltoid muscles.

Electrical stimulations are indicated when one muscle or a small muscle group is paralyzed.

Weight-lifting exercises are recommended for increasing strength of muscles.

The Latent Period of Muscular Contraction

Alexander Sandow, Ph.D., New York. In ARCHIVES OF PHYSICAL MEDICINE, 31:6:367, June 1950.

When a muscle is activated by a stimulus directly applied to its fibers, a short time-interval passes before the muscle begins to develop tension. This interval is the mechanical latent period—or, briefly, the latent period (LP)—of the muscle's response. So short is this time lapse that until recently a great part of the research on this phenomenon—extending back almost a century—dealt merely with the question of its existence, for many investigators believed that the LP was an artefact due to inertia in response of the recording apparatus.

This question was essentially settled in 1922 by Rauh who studied the LP by means of an extremely light and sensitive optical myograph. Not only did he validate the view that the LP really exists, but, more important, he found that the stimulated muscle actually relaxes very slightly during the latter half of the LP.

Integrating our various results presented here, we postulate that excitation by a stimulus serves to release calcium from the cortical or membrane regions of the muscle fibers. The interval from the instant of application of the shock to the beginning of the latency relaxation probably represents the period for this to occur. We suppose, at any rate, that this process is an essential event in excitation-contraction coupling. The free calcium activates myosin-adenosinetriphosphatase thereby permitting this enzyme to form a complex with its substrate, adenosinetriphosphate, which is represented mechanically by the latency relaxation. Once the complex is formed, adenosinetriphosphate is hydrolyzed and the energy so released is immediately taken up by the actomyosin, which then converts this energy into the mechanical output of tension (or work) of the muscle.

It must be emphasized, nevertheless, that this hypothesis is the result of a series of interpretations, each of which may be seriously questioned. Also, these interpretations are based widely on latent period alterations. Therefore, it would be better to designate our views of the excitation-coupling and mechanochemical energization processes as working hypotheses. At least, that is how they are being used at present, and, as such, they certainly have the virtue, if no other, of suggesting further lines of research, now being developed in my laboratory, not only on the latency phenomena but also on excitation and the contraction and relaxation periods of the muscular response.

One final comment remains to be made. The research I have reported is concerned with the fundamental mechanisms of excitation and contraction, and nothing I have said bears obviously on any clinical muscular dysfunction. I do not think I need to argue here, however, for the need of fundamental studies of normal muscle as a basis upon which medical application may ultimately be made. It would, indeed, be most interesting and clinically probable, I believe, to utilize the methods and orientation which I have developed in this paper in the problem of various muscular disorders, especially in those of the experimentally induced atrophies. It is our plan, as soon as conditions are favorable, to undertake such research.

The Use of Electromyography in the Diagnosis of Neuromuscular Disorders

O. Leonard Huddleston, M.D., Ph.D., Santa Monica; James G. Golseth, M.D., Alberto A. Martinacci, M.D., Elizabeth Austin, M.D., Los Angeles. In ARCHIVES OF PHYSICAL MEDICINE, 31:6:378, June 1950.

The present and future status of electromyography is discussed.

A brief discussion is presented regarding the proper selection of equipment and technic. It is pointed out that for routine clinical work only a single-channel electromyograph is required and that the needle electrode technic is preferable when used to assist in the diagnosis of neuromuscular disorders.

In electromyography the important physiologic principle used is the detection and proper examination of the electrical potentials of skeletal muscles associated with contractile process of the muscle fibers.

The electromyographic criteria used in classifying voltages associated with muscular contraction are those of (a) wave form, either simple or polyphasic, (b) magnitude of voltages, either of a single wave or of voltages of a series of waves—"power readings"—over a given period of time, (c) duration in milliseconds, (d) frequency of waves in terms of cycles per second, (e) audio-sound of the various waves.

The electromyographic characteristics of normal and abnormal neuromuscular responses were discussed.

The dominant electromyographic features of various types of paralyses resulting from primary diseases or disorders of the skeletal muscles, the neuromuscular junctions, lower motor neuron, functional disorders of the segmental and long circuiting reflexes, upper motor neuron, and cortical abnormalities are presented.

Combining electromyographic data with other clinical data facilitates the differential diagnosis of such conditions as primary muscular dystrophies and atrophies,

upper and lower neuron diseases, rigidity and spasticity of skeletal muscles, physiologic block and organic nerve lesions, hysterical paralysis, or malingering, and organic paralysis, backache of acute or chronic postural strain, and that of compression lesions.

In addition to its use in differential diagnosis, electromyography may be employed to identify the segment of the spinal cord or spinal nerve root or roots involved in a compression lesion.

Electromyography also may be used in securing objective evidence for court testimony in medical legal cases.

Effects of Pituitary Adrenocorticotropic Hormone (ACTH) Therapy: Electroencephalographic and Neuropsychiatric Changes in Fifteen Patients

Paul F. A. Hoefer, M.D., and Gilbert H. Glaser, M.D., New York. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:7:620, June 17, 1950.

The adrenocorticotropic hormone of the pituitary (ACTH) is now being used in the treatment of many disorders such as rheumatoid arthritis, lupus erythematosus, periarteritis nodosa, dermatomyositis, rheumatic fever, allergic states, and other conditions involving mesenchymal tissue. The effect of this substance on the course of infections, neoplastic diseases, metabolic disorders, myopathies, and mental illness is also being evaluated.

Pituitary adrenocorticotropic hormone (ACTH) was administered to fifteen patients with a variety of diseases.

Significant changes in the electroencephalogram occurred in thirteen of the fifteen cases.

Psychiatric changes, in two instances severe, occurred in ten of the fifteen patients.

The mode of production of either type of change is not clear. Various physiologic and psychologic factors are discussed.

The present report is regarded as preliminary, and further studies are in progress.

It should be emphasized that powerful side-effects may accompany the therapeutic achievements of pituitary adrenocorticotropic hormone. This is especially important in view of the necessity of long-range planning for the use of the compound in chronic diseases.

The Results of the Treatment of Active Minimal Pulmonary Tuberculosis with "Modified" Bed Rest

A Statistical Analysis of 289 Patients Followed for Seven Years after Discharge from Trudeau Sanatorium. Roger S. Mitchell and Jack R. Knudson. In THE AMERICAN REVIEW OF TUBERCULOSIS, 61:6:809, June 1950.

The problem of the proper treatment of minimal pulmonary tuberculosis is of growing importance because of the increasing number of minimal lesions being discovered by routine and mass roentgenography. While bed rest has been the keystone of the treatment of this disease, there is much disagreement as to the *degree* and *duration* of bed rest which should be employed. "Strict" bed rest seems to have the most support. "Modified" bed rest has been preferred by others. Finally, a combination of "rest and exercise" has also been recommended.

"Modified" bed rest is defined in this report as from twenty to twenty-one hours per day reclining in bed or on a chaise longue, with meals eaten in an adjoining room, and full bathroom privileges. Riding or walking to other buildings for examinations was permitted, but no other outdoor exercise was allowed. "Strict" bed rest is defined as twenty-three and one-half to twenty-four hours per day in bed, with the use of bedpans, stretchers for transportation to laboratories, and the like. Twenty-two of the patients studied were so treated for one to three months before admission to Trudeau Sanatorium but, because of its very limited use, this "strict" bed rest was regarded as "modified" bed rest for the purposes of this study.

Summary and Conclusions: (1) There were 577 patients classified as having "minimal" pulmonary tuberculosis on admission to Trudeau Sanatorium in the eleven years from 1934 through 1940. In retrospect, 307 of these patients were determined to have had *uncomplicated active* minimal pulmonary tuberculosis, 289 of whom were followed for seven years or more after discharge and were subjected to a statistical analysis.

(2) After initial treatment with "modified" bed rest, the cumulative incidence of one reactivation or more during the period of treatment and for seven years following discharge was 37 percent.

(3) The late results of "modified" bed rest treatment were favorable; only 5 percent of the patients had died of tuberculosis, and 4 percent were chronically ill with the disease in 1948 to 1949. Except for those dead from nontuberculous causes, the balance were well and working when last contacted.

(4) There was a significant relationship between the incidence of reactivation and the following: the age of females, the estimated age of the lesion, the extent of involvement, the presence of symptoms, the time spent in the sanatorium, and the time spent away from full employment.

(5) There was no significant relationship between the incidence of reactivation and the following: the age of males, constitutional symptoms, the location of the lesion, one or more "positive" versus "negative" sputum findings, the rapidity and degree of clearing on serial roentgenograms, the presence of rales or elevated sedimentation rate on admission, and the duration of "modified" bed rest.

(6) Evidence is presented suggesting that the newly acquired minimal lesion is potentially more hazardous than the older minimal lesion.

(7) There is need for controlled and comparative studies to assess the relative merits of "modified" bed rest, more lenient regimens, and the "strict" bed rest regimens used in the treatment of minimal pulmonary tuberculosis.

Abstract of the Minutes of the Meeting of the Council on Physical Medicine and Rehabilitation, December 2 and 3, 1949.

In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:7:654, June 17, 1950.

The Council voted that henceforward the groups of consultants should be designated as Advisory Committees. Definitions of the word "rehabilitation" were discussed, and it was voted that the following definition be adopted:

"Rehabilitation is the process of attempting to improve the health of handicapped people and returning them as useful members of society at the earliest possible moment."

The Committee on Field, Scope, and Present Status reviewed the list of products considered by the Council. The Council voted not to consider artificial limbs, orthopedic mattresses, bed boards, bed cranes, hot pack heaters, or gastroscopes. It was voted, however, to go forward

with the critical consideration of certain mechanical-bicycle exercisers. There was discussion of unsatisfactory advertising of disinfecting ultraviolet lamps, glycol vaporizers, and certain hearing aids.

The Council heard reports on essential requirements for schools of physical therapy and schools of occupational therapy.

Attention was called to the fact that the Council will soon reach the quarter-century mark in its history and that the recent establishment of a Section of Physical Medicine and Rehabilitation in the American Medical Association by the Board of Trustees is an indication of the extent to which the Council has gained recognition for this important field of medicine.

Prognosis in Poliomyelitis

R. E. Lenhard. In JOURNAL OF BONE AND JOINT SURGERY, 32-A:1, January 1950. Abstracted in JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:5:500, June 3, 1950.

Lenhard presents a survey of the 1944 poliomyelitis epidemic in Maryland, which was the largest recorded in that state, with 499 cases (24.9 per 100,000 population). There were sixteen deaths (3.2 percent). The survey is a two-year follow-up study, and, although it represents the probable limit of improvement of muscles, it does not relate the end of the story of deformities. Wherever there is imbalanced power in antagonistic muscle groups, deformities can occur later. It was possible to compare 150 cases treated by nonsupportive methods with 150 cases treated by supportive methods. In the former series there were thirty-five deformities in twenty-two cases; in the latter, nineteen deformities in fifteen cases. Thus fewer deformities occurred in the cases treated by supportive therapy and physical therapy. The results of the 1941 and the 1944 epidemics were similar, except that slightly more patients had residual involvement in 1944. Approximately 60 percent of the patients obtained a good recovery. Treatment should be carefully supervised and guided by muscle examinations. Supportive treatment is important. Delay in recovery and persistence of weakness have been observed in patients allowed to fatigue muscles by overtreatment, too much activity, or lack of necessary support. Treatment given without regard to the protection of muscles results in more deformities.

Fibrositis and Segmental Neuralgia

Joseph M. Strong, M.D., Elyria, Ohio. In THE OHIO STATE MEDICAL JOURNAL, 46:6:554, June 1950.

One of the most common complaints confronting physicians in general practice is low back pain or pain in the extremities. It is also true that many of these patients leave the physician's office undiagnosed and treatment often is disappointing. Frequently these patients made the circuit of various physicians, finally ending up with some charlatan. Truly these patients are perplexed, but no more so than the physicians who have diligently tried to meet their problem only to realize failure. I venture to say that there are no more than a handful among you readers who have not lost sleep attempting to speculate on the cause of some patient's backache which has been resistant to treatment.

An attempt has been made to classify cases of low back pain which fall into the class of fibrositis. This group has a very definite clinical history and physical findings.

Scientifically, insufficient evidence exists to warrant the acceptance of the presence of inflammatory changes in intramuscular fibrous tissue as an explanation of the palpable nodules found in these cases.

Briefly, evidence has been presented to show that this entire syndrome can be explained on a mechanism involving the sympathetic nervous system with its vasomotor effect, the localized muscle spasm with subsequent production of local and referred pain in a segmental distribution.

Whether the etiology be of a rheumatic, traumatic, or an infectious nature, a myalgic lesion develops from which secondary phenomena originate. A reflex action is set up and all forms of therapy, whether they be medical, mechanical, manipulative, or chemical, tend to break up the reflex mechanism.

Many errors in diagnosis have resulted because the occurrence of this syndrome was not appreciated, leading to unnecessary surgery or medical treatment. Many cases diagnosed as sacroiliac, lumbosacral strains, or neuritis of the extremities are actually myospastic syndromes.

Stress is placed on more complete examination of the back. The more frequent locations of tender areas have been presented. Guarded manipulations of the back and the judicious use of procaine is recommended.

A better and more logical theory to explain the so-called fibrositis syndrome is offered.

Conclusion: (1) A classification of patients falling into so-called fibrositic syndrome group is presented.

(2) The presence of fibrositic involvement of muscle in these cases is not accepted by the author.

(3) Typical locations of myalgic areas are mapped out.

(4) A theory to explain the mechanism of the production of the fibrositic syndrome, utilizing as a basis localized myospasm with referred pain mediated through the sympathetic nervous system, is offered.

(5) The term "myospastic syndrome" is suggested to replace the term "fibrositic syndrome."

The Problem of Spasm in Skeletal Muscle: A Clinical and Laboratory Study

Alan Hartell, M.D., Sedgwick Mead, M.D., and Emily Mueller, M.S., St. Louis. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:7:640, June 17, 1950.

The concept of skeletal muscle spasm is widely used, despite the fact that a generally accepted definition of this term does not exist. Nevertheless, the clinical literature dealing with such diseases as poliomyelitis, arthritis, low back pain, and many other conditions abounds with articles in which the term spasm is persistently used. It is commonplace on medical and orthopedic ward rounds and has even assumed medicolegal sanction. Such a commonly held concept ought to have a clear and concise pathophysiologic basis, easily understood and agreed on by all. Yet a search of the literature and especially of textbooks of physiology, neurology, orthopedics and medicine fails to reveal any but the vaguest explanations, not only of the word spasm, but even of the related concepts of tonus or tone. To make matters worse, spasm is often confounded with rigidity, spasticity, spasms, contracture (histologic or physiologic), and cramp.

This study was undertaken in an attempt to: (1) investigate the meaning of the spasm concept and formulate a definition sufficiently inclusive and generally acceptable, (2) discover simple means by which to demonstrate this condition objectively, and (3) determine whether there

is by necessity a definite, mutual, cause-and-effect relationship between pain and spasm.

All experiments were performed on human subjects, either patients or laboratory personnel.

CLINICAL OBSERVATIONS

Low Back Pain—Forty-two patients with acute low back pain of diverse causation were studied. The term spasm is frequently used in connection with this condition. Many of these patients showed lists toward or away from the affected side. Indurated or elevated muscle contours could sometimes be palpated on the shortened, supposedly contracted side.

When electromyograms were taken from both sacrospinalis groups of the standing patient it was found that electrical activity existed on the convex side opposite the list and that the supposedly painful, contracted muscle on the concave side was actually electrically inactive. This is a phenomenon of normal stance. Deviation from the vertical axis brings out a holding or antigravity activity opposite the direction of bending. Such activity was not present when the patient was prone and the need for antigravity postural activity removed.

Fractures and Direct Trauma—It is commonly accepted that the muscles around acute fracture sites are in a state of spasm. The amount of force necessary to separate overriding bone ends often is cited as proof of this axiom. The muscles around the fracture sites of eight patients with acute major fractures of long bones were examined both with surface and needle electrodes. These muscles generally showed no evidence of spontaneous electrical activity, unless attempted active or passive motion of the affected area produced normal activity.

Poliomyelitis—Over 100 children and adults hospitalized at the St. Louis City Hospital with acute poliomyelitis during the 1949 epidemic were checked. Needle electrodes were used in all patients clinically suspected of spasm. Only in two boys did we find persisting electrical activity in the sacrospinalis groups which could not be abolished in any position. Both had pronounced opisthotonos. The electrical activity was sustained, indistinguishable from normal activity, and more pronounced with the patient supine than prone. This observation is compatible with the existence of spasm. Neither patient complained of pain, either at rest or when moved. A careful examination of the remainder of the patients with acute poliomyelitis failed to reveal any objective evidence of spasm as manifested by spontaneous electrical activity during the first fourteen days of the disease.

SUMMARY AND CONCLUSION

Spasm in skeletal muscle is a reversible state of sustained, involuntary contraction accompanied with muscular shortening and associated with electrical potential changes.

Groups of patients with various types of low back pain, fractures, and poliomyelitis have been examined carefully for the existence of muscular spasm, using electromyographic technics. Only in an inconsequentially small number could such spasm be detected. It is believed that the clinical diagnosis of spasm in peripheral conditions such as backache, fracture, or poliomyelitis will be erroneous in a large percentage of cases.

Clinical and experimental work is described which shows that there seems to be no specific cause-and-effect relationship between spasm and painful peripheral states.

A strong plea is made for thoughtful use of the term spasm, differentiating it carefully from spasms, spasticity, tonus, contracture, cramp, and rigidity.

Phenosulfazole (Daviosul) in Acute Poliomyelitis

MAX J. FOX, M.D., and EVANS Z. HORNBERGER, JR., M.D., Milwaukee. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 141:6:535, June 10, 1950.

The purpose of this paper is to report on observations made during the Milwaukee poliomyelitis epidemic of 1948 and on experiences with the chemotherapeutic agent, phenosulfazole (daviosul), which is N-(2-thiazolyl)-phenol sulfonamide. Our report is based on the 277 patients with poliomyelitis admitted to South View Hospital for treatment.

Milwaukee followed the national severe-epidemic pattern in 1948. Of 277 cases of poliomyelitis there were 92 cases (33.2 percent) of the bulbar and spinobulbar type, of which 44 (47.8 percent) were fatal.

The incidence of poliomyelitis gradually rose throughout July and August to a peak in September, with the most severe cases and the most deaths occurring in August.

Treatment with phenosulfazole was begun early in September as the result of favorable reports on use of this drug in mouse poliomyelitis. Twenty-nine patients who had bulbar and spinobulbar forms of poliomyelitis received the drug, and the mortality rate was 34.5 percent. During the same period 19 patients did not receive the drug and showed a mortality rate of 42.1 percent. There appeared to be no alteration in the length of temperature elevation or the length of hospitalization in the group receiving the drug, and instances of drug toxicity were not noted.

It was our clinical impression that phenosulfazole offered little in the treatment of poliomyelitis. This impression is substantiated by the facts that the mortality rate in both the treated and untreated groups fell within the expected range for a severe epidemic and that the chi square test showed this difference in mortality of the two groups to be not statistically significant.

We believe that further evaluation of phenosulfazole or any other type of therapy in poliomyelitis should be based on its ability to lower the mortality rate significantly for patients in the bulbar and spinobulbar groups only.

Spastic Paralysis: Treatment of, by the Use of Reflex Inhibition

K. BOBATH, M.D., and BERTA BOBATH, London. In THE BRITISH JOURNAL OF PHYSICAL MEDICINE, 13:6:121, June 1950.

In this paper it is proposed to describe the principles of a new treatment of disorders of movement met with in the spastic patient. The group of cases to which this treatment applies comprises the congenital and acquired hemiplegias, the diplegias, and the comparatively rare monoplegias.

A New Approach to the Problem of Spasticity—In all these patients we meet with spasticity, an increase of muscle tone varying from a mild degree to a state approximating to decerebrate rigidity, depending upon the seat of the lesion and the extent of co-involvement of the extrapyramidal system. In addition there is a loss of voluntary movements together with a return to a lower level of integration, with primitive synergic patterns of movement. In cases of long standing these are modified by more or less successful attempts at compensatory adjustment.

To sum up, we believe that it is possible to restore to the spastic patient the lost cortical inhibitory control.

We can reduce muscle tone generally, and decrease disparity of tone between the opposing muscle groups, by "positioning," thus releasing the inhibited phasic reflexes. These phasic reflexes are then broken up and partially inhibited, using *Schaltung* (as described) for this purpose. The reduction of spasticity will facilitate the normal functioning of the proprioceptive system. Through the medium of the afferent pathways, stimuli of low intensity and of short duration (that is, below the latency periods of tonic reactions) are applied, and movements are instituted and guided throughout their course. Thus the patient is enabled to build up the inhibitory control, progressively, from the level of integration to which he was reduced as a result of the lesion.

The General Practitioner Looks at Cerebral Palsy

H. H. Russ, M.D., Blue Earth, Minn. In THE CRIPPLED CHILD, 28:1:20, June 1950.

The constantly growing volume of popularly written literature on the subject of cerebral palsy in children is indicative of the rising interest in this long neglected group.

The situation in recognition of cerebral palsy is somewhat similar to that of infantile paralysis, in that the general practitioner is the one most likely to be in attendance at the first, and during the early infancy of such a child. The problem of diagnosis either may be very difficult or all too easy. If the handicap is severe, evidenced by extreme deviation from the normal, the diagnosis may be quite apparent. This may easily lead to injudicious remarks as to the probable future progress of such a child, and may produce a serious strain on the physician-patient relationship. I find it most disconcerting, in interviewing a number of mothers of cerebral palsied children, to hear the often repeated antagonism toward the medical profession for its lack of interest and sympathetic understanding of their problem. The disappointment of parents is acute and very real, and, in their search for understanding, altogether too many of them fall into the hands of unscrupulous quacks who are always ready to promise cures and miracles.

To the young general practitioner who wonders if he will ever see a case of cerebral palsy, we can now say that we are discovering there are at least as many as there are poliomyelitis victims, ranging from the mild to the very severe cases. If he is really interested in becoming a beloved physician, I'd advise him to plunge in, inform himself by any and all means available, and to keep posted on the growing quantities of literature on this recently rediscovered affliction. Few cases will embody more challenge to his skill—or more satisfaction for a job well done.

The Clinical Application of Physical Medicine in Some Older Patients

Arthur L. Watkins, M.D., Boston. In MEDICAL ANNALS OF THE DISTRICT OF COLUMBIA, 19:5:245, May 1950.

The purpose of this paper is to present to you some very practical applications of physical medicine which we have found of value, particularly in the steadily increasing older age group.

Methods of utilizing physical medicine in some conditions affecting the older age group have been described.

The diseases discussed in detail include degenerative arthritis of knees, hips, spine and hands, and idiopathic facial paralysis.

Epidemiologic Characteristics of Poliomyelitis in Iceland

J. Sigurjonsson. In AMERICAN JOURNAL OF HYGIENE, 51:1, January 1950. Abstracted in JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:5:494, June 3, 1950.

Analysis of the epidemiologic features of poliomyelitis in Iceland, as manifested since the disease was first recognized in 1904, provides, according to Sigurjonsson, an illustration of the behavior of this disease as influenced by the conditions of living, climate, ecology, and environment peculiar to this far northern country. The causative virus has been able to maintain itself over considerable periods of time in this relatively isolated island population of 80,000 to 150,000, one third of which is concentrated in a single urban area and the rest scattered over a huge territory in small communities and on farms with limited intercommunication. Moreover, the virus has become prevalent in this population during a period when transport, communication, living conditions, home hygiene, and community sanitation were being steadily improved.

Poliomyelitis has appeared in epidemics at intervals of about ten years. As measured by morbidity and mortality rates, these epidemics have been severe in comparison with those in countries of northern Europe and North America. During the interepidemic periods the disease has either completely disappeared or existed at a low and probably largely subclinical level.

Cases of poliomyelitis have occurred in every month of the year but usually reach maximum numbers in the autumn. The most recent epidemic reached its peak in the winter.

The age distribution has shown an interesting shift. In the earlier epidemics the highest attack rate was in children under five years of age. In recent years there has been a distinct shift in the distribution of cases toward older ages. In the latest epidemic the highest attack rate was reached in the fifteen to nineteen-year age group, and a considerable proportion of cases was in adults. This shift in age distribution is more pronounced than that observed in some parts of Europe and North America. The author suggests as an alternative hypothesis the possibility that the shift in age distribution is due in part to coincident prevalence of an unidentified disease which closely resembles poliomyelitis. This might account also for the unusual (midwinter) seasonal distribution and for the extremely high morbidity rates.

Unilateral Exercise

Editorial. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:6:559, June 10, 1950.

Unilateral, progressive resistance exercise has been shown to augment the strength and endurance of the limb exercised and also of the unexercised contralateral extremity. Previously published reports had mentioned this phenomenon and had served to draw attention to the possibility of cross education of extremities if the patient would cooperate and was properly trained. A recent report presents additional data on the influence of exercise on work capacity.

The restoration of function, when loss of strength and endurance is the primary cause of the physical disability, depends on systematic exercise in the "overload" zone. The amount of work performed must exceed that normally performed with ease. Furthermore, the voluntary cooperation of the patient is essential. To overcome fear of pain, unconscious malingering, and other retarding

factors, simple and readily accepted methods of augmenting work output are important.

Hellebrandt and Houtz postulated that the contraction of homologous parts might be sufficiently dynamogenic to excite the weaker side to increased effort since vigorous unilateral exercise elicits associated movements or increased tone in symmetrically disposed muscle groups.

The application of these observations to medical practice offers interesting speculation, especially in the field of physical medicine. As Hellebrandt and Houtz point out, it has long been known that forceful tonic contraction of the normal arm of a patient with hemiplegia produces associated movements in the paralyzed contralateral extremity. And the affected side of a child with infantile spastic hemiplegia involuntarily executes movements similar to those produced in the normal extremity, although the child cannot voluntarily produce such movements solely in the spastic limb. Other diseases show similar phenomena. The authors thus have concluded that return of neuromuscular function following injury or disease may depend on volitional exercise which must exceed work levels easily reached. More research in this field certainly seems indicated.

Midcentury White House Conference on Children and Youth

Henry F. Helmholz, M.D., Washington. In JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:7:625, June 17, 1950.

The theme of the Midcentury White House Conference —the development in children of mental, emotional, and spiritual qualities that will lead to happy childhood and responsible citizenship—has been related herein to the general practitioner and his great opportunity for rendering services. I want to outline plans of the conference: "(a) to bring together, in usable form, pertinent knowledge related to the development of children, and indicate areas in which further knowledge is needed; (b) to examine the environment in which children are growing up, with a view to determining its influence on them; (c) to study the ways in which the home, the school, the church, welfare agencies, and other social institutions, individually and cooperatively, are serving the needs of children; (d) to formulate, through cooperative efforts of laymen and specialists, proposals for the improvement of parental, environmental, and institutional influences on children; and (e) to suggest means whereby these proposals may be communicated to the people and put into action."

It is the first White House Conference in which youth is represented in the national committees and is taking an active part in the work of the councils and committees.

Tendon Injuries

Chester A. Phillips, Jr., M.D., Pittsburgh. In THE PENNSYLVANIA MEDICAL JOURNAL, 53:5:487, May 1950.

Tendon surgery requires a more rigid atraumatic and aseptic technic than does general surgery.

Primary suture of tendons will give a better result than secondary repair. However, primary repair that has failed makes secondary repair more difficult and makes the prognosis less favorable.

Permitting motion prior to the fifteenth day weakens the healing tendon and provokes tissue reaction, resulting in binding adhesions.

Stuttering—The Problem Today

Isaac W. Karlin, M.D., Brooklyn. In THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, 143:8:732, June 24, 1950.

Stuttering is a disturbance in the rhythm of speech, and the symptoms unfold gradually. The principal present-day theories are that stuttering is (1) a psychoneurosis or a personality disorder, (2) a habit or a behavior that is learned, and (3) an organic disorder of language function. The theory that it is due primarily to a slower process of myelinization of the cortical speech areas offers a satisfactory explanation of the basic facts. Emotional and environmental factors play an important role in unfolding and perpetuating the disorder. Emphasis in the treatment should be on prevention. Every preschool child showing early signs of stuttering should receive immediate treatment.

Injuries to the Lower Extremities and Their Significance in Industry

Clifford C. Snyder, M.D., and T. G. Blocker, Jr., M.D., Galveston. In SOUTHERN MEDICAL JOURNAL, 43:7: 574, July 1950.

Industrial accidents comprise a large part of traumatic surgery and must be given careful attention, not only with respect to proper treatment *per se*, but also with regard to medicolegal and insurance compensation considerations. In injuries to the lower extremities, the responsibility usually rests with the surgeon to determine the duration of complete and partial disability and to outline possible permanent limitations on the patient's physical activity so far as his occupation is concerned. He must be able to withstand the degree of ordinary, day-to-day trauma which his job requires, whether minor, as in the case of the worker who merely stands at his bench, or severe, where strenuous physical exertion is necessary for maximum efficiency.

Postoperatively, the patient is kept in bed with constant elevation of the extremity until the wound has healed and then physical therapy is instituted in the form of massage, passive exercise, and eventually active motion.

Meet Our New Contributors

Cicenia, Egbert F., Director, Physical Rehabilitation Section, New York State Rehabilitation Hospital, West Haverstraw, New York. Mr. Cicenia received a diploma from the Savage School for Physical Education, a B.S. in education from Rutgers University, and an M.A. in corrective physical education from Columbia University Teachers College. He also received his Certificate in Physical Therapy from Columbia. He has been a rehabilitation officer with the Naval Rehabilitation Program and Chief of Corrective Therapy at the Halloran Veterans Administration Hospital, New York. Mr. Cicenia is a member of the American Registry of Physical Therapy Technicians.

Griffin, James E., Senior Physical Therapist, Hospital for Chronic Illness, Rocky Hill, Connecticut. Mr. Griffin attended Western Maryland College for his A.B. degree. He received his M.A. and his physical therapy certificate from Duke University. He served as a staff physical therapist at the Duke University Hospital for two years. Mr. Griffin is a member of the American Physical Therapy Association and the American Registry of Physical Therapy Technicians.

Hartman, Anna C., physical therapist, Wisconsin General Hospital, Madison, Wisconsin. Miss Hartman was graduated from the Sargent College of Physical Education of Boston University with a degree in physical therapy, and later received her M.S. from the University of Wisconsin. She has served as a physical therapist with the U. S. Army Women's Medical Specialists Corps. Miss Hartman is a member of the American Physical Therapy Association.

Huberman, M.D., Morton, Chief Consultant in Physical Medicine, New York State Rehabilitation Hospital, West Haverstraw, New York. Dr. Huberman was graduated from New York University, and received his M.D. and M.D. from Wayne University College of Medicine. He has been Chief of Clinic, Physical Therapy, Vanderbilt Clinic, Columbia-Presbyterian Medical Center; Instructor, College of Physicians and Surgeons, Columbia University; Attending Physiatrist, NYRO, Veterans Administration, New York City. Dr. Huberman is a member of the American Board of Physical Medicine and Rehabilitation, the American Congress of Physical Medicine, and the New York Society of Physical Medicine.

James, Herbert H., Senior Physical Therapist, Hospital for Chronic Illness, Rocky Hill, Connecticut. Mr. James received an B.N. from the Pennsylvania Hospital School of Nursing for Men, and his physical therapy training from the School of Physical Therapy at Graduate Hospital, University of Pennsylvania. He was a physical therapist and instructor at the Rehabilitation Center, Philadelphia General Hospital. He is a member of the American Physical Therapy Association and the American Registry of Physical Therapy Technicians.

Richmond, M.D., Julius B., Professor of Pediatrics, University of Illinois College of Medicine, 1819 West Polk Street, Chicago. Dr. Richmond attended the University of Illinois for his B.S., his M.S. in physiology, and his M.D. He has been a flight surgeon with the AAF and resident physician with the Polio Convalescent Center in Rockford, Illinois. He was formerly Assistant, and then Associate, Professor of Pediatrics at Illinois. Dr. Richmond is a member of Sigma Xi, the American Academy of Pediatrics, and the Society for Pediatric Research.

Reprints Available

(Continued from p. 595)

POSTURE TRAINING FOR ADOLESCENTS
CAROLYN BOWEN (5c)

PHYSICAL THERAPY AND CHEST SURGERY
FLORENCE S. LINDLEY (10c)

PASSIVE AND ACTIVE STRETCHING OF MUSCLES: *Spring Stretch and Control Group*
SONYA WEBER, D.Sc., AND HANS KRAUS, M.D. (5c)

TOYS, GAMES AND APPARATUS FOR CHILDREN WITH CEREBRAL PALSY
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THE NEED FOR PHYSICAL THERAPY IN PUERPERIUM CARE
WILLIE REBECCA HARVEY (20c)

REHABILITATION OF THE INJURED CHEST
VICTOR P. SATINSKY, MAJ., MC, AUS, AND DORA DYRENS (20c)

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MEASUREMENT OF JOINT MOTION—PARTS 1, 2, & 3
MARGARET LEE MOORE (25c)

A HISTORY OF THE AMERICAN PHYSICAL THERAPY ASSOCIATION
An account of the Association's activities and growth from 1921-1946
IDA M. HAZENHUYSE (50c)

THE PHYSICAL THERAPY REVIEW—*Special Anterior Poliomyelitis Issue.* July-August 1947 (50c)
The magazine contains 11 articles by leading physicians and physical therapists on research and treatment of polio. There are 16 abstracts of articles on polio from current medical journals.

THE PHYSICAL THERAPY REVIEW—*Special Cerebral Palsy Issue.* May-June 1948 (50c)
This magazine contains 9 articles by leading physicians and physical therapists on research and treatment of cerebral palsy. There are 5 abstracts of articles on cerebral palsy from current medical journals.

PHYSICAL THERAPY REVIEW—*Special Functional Issue.* November 1949 (50c)
This magazine contains 8 articles by leading physicians and physical therapists on functional training, crutch walking, and wheel chairs. There are 26 abstracts of articles on functional training from current medical journals.

Book Reviews

Medicine Throughout Antiquity. *By Benjamin Lee Gordon, M.D.; Member, American Association of the History of Medicine and American Academy of Ophthalmology and Otolaryngology; certified by American Board of Ophthalmology; Attending Ophthalmologist to Shore Memorial Hospital, Somers Point, New Jersey; and to Atlantic County Hospital for Tuberculous Diseases and Atlantic County Hospital for Mental Diseases, Northfield, N. J.; Authorized Medical Examiner for Civil Aeronautics Administration, Dept. of Commerce, Washington, D. C.; Author of "The Romance of Medicine." Foreword by Max Neuburger, M.D. Cloth. Price, $6.00. 865 pages with 337 illustrations. F. A. Davis Company, Philadelphia, 1949.*

The author states in his preface "The purpose of this book is to present an historical resume of medicine as it was conceived, developed, and practiced by the various peoples of antiquity. A determined effort has been made throughout this work to emphasize outstanding historical facts."

Medicine Throughout Antiquity is a survey of medical history which terminates with the fall of Rome (476 A.D.), the date at which most medical histories begin. The book is divided into two parts which cover three periods of ancient medicine. Part One deals with prehistoric and protohistoric medicine, which begins with the birth of man and ends with the rise of the philosophical school of Ionia. Included in this section is a short review of what is known of early man. Part Two deals with the Greco-Roman Period, to which is added an account of Talmudic medicine.

The early use of physical measures is of special interest to physical therapists. Although these measures were adopted to drive out evil spirits by the primitive peoples, nevertheless many of the physical measures used formed the basis of modern physical therapy.

Dr. Gordon has endeavored, as far as possible, to permit the ancient records and doctrines to speak for themselves. The book is interesting as well as informative. Anyone interested in medicine will find it provocative reading.

Pavlov. *A Biography. By B. P. Babkin, M.D. Cloth. Price, $6.00. Pp. 353 with 7 illustrations. The University of Chicago Press, 1949.*

This book is an account of the life and scientific achievements of the great Russian physiologist, Ivan Petrovich Pavlov, written by Pavlov's senior surviving pupil. The author served as Pavlov's assistant in the Department of Physiology at the Institute of Experimental Medicine in St. Petersburg for ten years and knew Pavlov well from 1901 till 1936. Thus the author speaks of Pavlov as a contemporary who was familiar with his scientific activity throughout the greater part of his life.

The book consists of four parts: Part I comprises the biography proper and the author's reminiscences of Pavlov. Parts II, III, and IV deal with his scientific achievements in the physiology of the cardiovascular, digestive, and central nervous systems.

The biography, although rather jerkily put together, gives an interesting insight into the character of the man as well as the scientist. For example, this incident was reported. Toward the end of the Eighties, Pavlov was a candidate for the chair of physiology in the University of St. Petersburg. At the time he was completely absorbed in observations on the transformation of a chrysalis into a butterfly. This professorship, which would have meant escape from unbearable financial straits, was given to someone else. Just as Pavlov's wife came into the room lamenting his failure to obtain the Chair, Pavlov discovered that his insects were dead. Pavlov replied, "Oh, leave me alone, please. A real misfortune has occurred. All my butterflies have died, and you are worrying over some silly trifle."

Most interesting is the account of the last thirty-four years of Pavlov's life (from 1902 until 1936) which were devoted almost exclusively to the study of the functions of the cerebral cortex by the method of conditioned reflexes. The author has presented the essence of Pavlov's scientific achievements in comprehensible form with generous quotations from the scientific literature and references to further monographs. The book is recommended for enlightening and interesting reading.

Electrotherapy and Actinotherapy. *By E. B. Clayton, M.B., B.Ch. (Cantab.), Consulting Physician to the Physical Treatment Department, King's College Hospital, London. First Edition. Cloth. Price, $3.00. Pp. 460 with 152 illustrations. The Williams and Wilkins Company, Baltimore, Maryland, 1949.*

The author's purpose in writing the book is to provide a textbook for physical therapy students in the fields of electrotherapy and actinotherapy. Two-thirds of the text is included in the discussion on electrotherapy, one-sixth on actinotherapy (which also includes infra-red therapy) and one-sixth on "treatments," a section which discusses all forms of physical therapy as they may possibly be applied to varied conditions which are classified under headings of joints, bones, and muscles; diseases of the nervous system; tuberculosis and skin conditions; and miscellaneous conditions from angina pectoris to Whitlow.

Over half of the book deals with the physics of electricity and radiant energy, including sources and devices used in their production. This presentation is on a somewhat elementary level, suitable for those who have never studied physics. The ideas are clearly presented and the illustrations accompanying the text are very good.

It is surprising that in a book of this sort there is no bibliography, and no references are listed anywhere in the text as sources of information—a lack which is particularly objectionable in the areas of physiological effects and therapeutic applications. Perhaps it should be assumed that all statements made are based upon the most up-to-date findings in clinical and experimental research, but there is no way of verifying the sources from which the material has been drawn.

Considered as a whole, the book may be a useful reference for students to use under close supervision, but should not be considered as a complete *guide* in the fields which it covers.

Epilepsy and Convulsive Disorders in Children. *By Edward M. Bridge, M.D. Price, $8.50. Pp. 670. McGraw-Hill Book Co., Inc., New York, 1949.*

This book is really a report of the experience accumulated from the Epilepsy Clinic at Johns Hopkins Hospital at Baltimore, and later at the Children's Hospital at Buffalo. It represents about twenty-two years of interest in the field of convulsive disorders in children. It should stand as a monument to those donors who have given generously of their financial resources to make possible the operation of such a clinic and the presentation of its material. This report deals with analyses of various phases of the problem in 742 children with epilepsy.

The author has divided his material into three groups. Part One is concerned with the etiological factors of epilepsy. The material is presented in detail with statistical treatment, and, finally, in one chapter he reviews the total background of epilepsy. This covers the conventional problems of heredity, brain injury, physiological status of the individual, and the emotional status. There is nothing revolutionary in the conclusions, but they are clearly stated and supported by factual material.

Part Two covers the types of seizures and their management from an individual level all the way up to that of a community problem. In this section will be found extremely interesting and valuable material regarding specific management of such things as an isolated convulsion in an infant and what one has to anticipate, how to evaluate febrile convulsions, dietary management, the role of psychotherapy, and community services.

Part Three describes the various diagnostic procedures used in studying convulsions. It is gratifying to see the author adopts a conservative attitude about the electroencephalogram, a thing that most less-experienced people forget. "The limitations of the electroencephalogram in diagnosing epilepsy must be appreciated, for otherwise serious error can be made. The procedure should be viewed as a valuable adjunct, but not as a substitute for other accepted methods of diagnosis."

This book must be accepted as one of the most up-to-date, comprehensive, and lucid presentations of epilepsy. It is full of factual material, ably put forth. It treats the literature comprehensively. The style of the book is highly meritorious. Each chapter is introduced by a set of pictures depicting the subject material. It is an idea seen elsewhere in other books but is none-the-less a clever and forceful visual summary. The drawings done by Ellis Sloan and Harry Roth deserve special mention. This book should be readily available to all pediatricians and neuropsychiatrists who deal with children.

Classified WANT-ADS

IMMEDIATE PLACEMENT FOR PHYSICAL THERAPISTS in California schools, hospitals, clinics. Three starting levels—Gr. 1 and 2 for work with adults, special field with handicapped children. Excellent starting salaries with 5 pay grades at each level. Vacation, sick leave, retirement plan. Nation-wide examinations now in progress. Write today to Dept. P-6, Recruitment Section, State Personnel Board, Sacramento, California.

WANTED—Experienced physical therapist to organize and conduct a cerebral palsy physical therapy program for pre-school and school-age children. Position open now for school year 1950-51. Good salary, challenging professional opportunity. Apply to Dorothy Smithson, Vermont Association for the Crippled, Rutland, Vermont.

WANTED—A qualified physical therapist in a growing rehabilitation center. For details, write Roy E. Patton, Director, Crossroads Rehabilitation Center, 5001 North New Jersey Street, Indianapolis, Indiana.

WANTED—A qualified physical therapist interested in diverse types of children's disabilities. For details, write Margaret Walker, Chief Physical Therapist, Texas Elks Crippled Children's Hospital, Box 7, Ottine, Texas.

WANTED — Qualified physical therapist for fully equipped department, supervised by orthopedist, in 17-man clinic. Experience not necessary. Excellent salary. Contact Mr. W. L. Nelson, Grand Forks Clinic, Grand Forks, North Dakota.

RATES

The rate per insertion is 7¢ per line. Typewrite your advertisement carefully and count 50 characters and spaces per line.

ALL WANT-ADS MUST BE PAID FOR IN ADVANCE. Make checks or money orders payable to the American Physical Therapy Association.

Institutions or physical therapists who do not wish their identity known may arrange for Blind Ad Code No. All such want-ads must include the following which will be counted as 2 lines:

Address replies to ..... care of **The Physical Therapy Review, 1790 Broadway, New York 19, N. Y.**

All remittances will be acknowledged and in case of Blind Ads the receipt will bear the "Code No." which will appear in the ad.

IMPORTANT

It is understood and agreed that the publisher shall have the right to reject or change the wording of any advertisement which in the opinion of the Editorial Board shall not be in agreement with the ethical standing of this publication; the advertiser agreeing that the Editorial Committee shall be the sole and exclusive judge of the acceptance of any advertisement.

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SCHOOLS APPROVED FOR TRAINING PHYSICAL THERAPISTS

By Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Medical Director	Technical Director	Entrance Requirements	Length in Months	Classes Start	Tuition	Certificate, Degree, Diploma
CALIFORNIA							
[1]Childrens Hospital Society, Los Angeles	Samuel S. Mathews	Sarah S. Rogers	a[2]-b[2]-d	14	Sept	$300	Cert. or Degree
[1]College of Medical Evangelists, Loma Linda, Calif.	F. B. Moor	S. Wm. Burdan	a-b-c-d	12	Sept	$225	Cert. or Degree
[1]Univ. of So. California, Los Angeles	Charles L. Lewmon	Charlotte W. Anderson	a-b-d-e-g[3]	14	Sept	$194	Cert. or Degree
[1]Univ. of California Med. School, San Francisco	Lucile M. Kising	Margery Wagner	d-e	12	Sept	$120[4]	Cert. or Degree
[1]Stanford Univ., Stanford (Palo Alto)	Wm. Northway	Lucile Daniels	a-d-e-f-g[3]	12	Jan June Sept	$120	Cert. or Degree
[1]Permanente Hospital, Oakland and Vallejo	O. L. Huddleston	Dorothy Haag	a-b-d	12	July	$300	Cert.
COLORADO							
[1]Univ. of Colorado Med. Center, Denver	Harold Dinken	Mary Lawrence	a-b-d	12	Sept	$300	Cert. or Degree
ILLINOIS							
Northwestern Univ. Med. School, Chicago	Emil D. W. Hauser	Gertrude Board	a-b-d-e	12	Oct	$450	Cert.
IOWA							
[1]Univ. of Iowa Med. School, Iowa City	W. D. Paul	Olive C. Farr	a[2]-e	12	Sept	$300	Cert.
KANSAS							
[1]Univ. of Kansas, School of Med., Kansas City	Donald L. Rose	Lilyan G. Warner & Ruth Monteith	a-b-d-g[3]	12	Feb Sept	$90[5]	Cert. or Degree
MASSACHUSETTS							
Boston-Boston School of Phys. Educ., Boston	Howard Moore	Constance K. Greene	g	36	Sept	$150	Degree
Simmons College, Boston	Wm. T. Green / Arthur L. Watkins	Janet B. Merrill	a[2]-b-d-g[3]	18-36	Sept	$450	Cert. or Degree
Boston Univ. College of Phys. Ed. for Women: Sargent College, Cambridge	Kenneth Christophe	Adelaide McGarrett	a-b-d-f-g[3]	12 4 yrs.	Sept	$405	Cert. or Degree
MINNESOTA							
[1]Univ. of Minnesota, Minneapolis	Frederic J. Kottke	Ruby M. Green	d-f-g	2 yrs.	Sept	$120[5]	Degree
[1]Mayo Clinic, Rochester	Karl C. Elkins	Harry Known	a-b-c	12	Sept	None	Cert.
MISSOURI							
[1]Washington Univ. School of Medicine, Barnes Hospital, St. Louis	Sedgwick Mead	Beatrice F. Schulz	f	2 yrs.	Sept	$450[6]	Degree
[1]St. Louis Univ. School of Nursing, St. Louis	A. J. Kothe	Sr. Mary Imelda	g[3]	36	Jan Sept	$300	Degree
NEW YORK							
Albany Hospital, Albany	John W. Ghormley	Catherine Graham	a-b-d	12	Sept	$256	Cert.
[1]Columbia Univ., New York	Wm. B. Snow	Fay Finkerton	a-c-f	1 or 2 yrs.	Sept	$450	Cert. or Degree
[1]New York Univ. School of Education, New York	George G. Deaver	Elizabeth C. Addoms	a[2]-b-d-g[3]	12	Sept	$360	Cert. or Degree
NORTH CAROLINA							
[1]Duke Univ. School of Med., Durham	Lenox Baker	Helen Kaiser	a[2]-b[2]-d	15	Oct	$300	Cert.
OHIO							
Cleveland Clinic, Cleveland	S. G. Gamble	Mildred Heap	a-b-d	12	Jan	$300	Cert.
PENNSYLVANIA							
D. T. Watson School of Physical Therapy, Leetsdale	Jessie Wright	Kathryn Kelley	a[2]-b[2]-d	12	Oct	$300	Diploma
[1]Univ. of Pa. School of Auxiliary Med. Services, Div. of P.T., Philadelphia	George M. Piersol	Dorothy Buethke	g[3] / e	4 yrs. 12	Sept Sept	$600[7] $60[7]	Cert. & Degree Cert.
TEXAS							
[1]Hermann Hospital, School of Physical Therapy, Houston	Oscar O. Selke, Jr.	Mary Elizabeth Kolb	a-b-d	12	Oct	$300	Cert. or Degree
[1]Univ. of Texas School of Med., Galveston	G. W. N. Eggers	Ruby Decker	a-b-d	12	Jan	$162[5]	Cert.
VIRGINIA							
[1]Baruch Center of Physical Med. of Medical College of Virginia, Richmond	Walter J. Lee	Susanne Hirt	a-b-c-g[3]	12	Sept	$275[5]	Cert. or Degree
WISCONSIN							
[1]Univ. of Wisconsin Med. School, Madison	Harry D. Bauman	Margaret Kuhli	a-b-f-g[3]	12	Sept	$120[5]	Cert. or Degree
MEDICAL DEPARTMENT—U. S. ARMY							
(a) Medical Field Service School, Brooke Army Medical Center, San Antonio, Texas, and	James E. Tate, Lt. Col., M.C.	Agnes P. Snyder, Major, WMSC	b-e	12[8]	Aug Mar	None	Cert.
(b) Fitzsimons General Hospital, Denver, Colorado, or	H. B. Lancombe, Colonel, M.C.	Olene M. Cole, Captain, WMSC	Completion of Medical Field Service School				
(c) Walter Reed General Hospital, Army Medical Center, Washington, D. C.	John H. Knitzer, Lt. Col., M.C.	Brunetta Knobithan, Major, WMSC	Completion of Medical Field Service School				

Entrance Requirements

For One-year Course: a—Graduation from accredited school of nursing; b—Baccalaureate degree with major in physical education; c—Two years of college with science courses; d—Three years of college with science courses; e—Baccalaureate degree with required science courses.

For Two-year Course: f—Two years of college with science courses.

For Four-year Degree Course: g—High school graduation.

[1]Male students admitted.

[2]Nonresidents charged additional fee.

[3]Certificate granted by Childrens Hospital Society; degree granted by University of California at Los Angeles.

[4]Tuition reduced second semester of second year.

[5]12 months includes training at the Medical Field Service School and Fitzsimons or Walter Reed General Hospitals.

[6]Additional college science required.

[7]Plus additional University fees.

[8]Advanced standing students accepted.

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